BOARD OF COMMISSIONERS

1 S. Main St., 9th Floor
Mount Clemens, Michigan 48043
586-469-5125 FAX 586-469-5993
macombcountymi.gov/boardofcommissioners

HEALTH SERVICES COMMITTEE

THURSDAY, JULY 17, 2008

AGENDA

1. Call to Order
2. Pledge of Allegiance
3. Adoption of Agenda
4. Approval of Minutes dated March 13 and April 10, 2008 **(previously distributed)**
5. Public Participation
6. Information Re: Incoming Director of Health Promotion/Disease Control at Health Department **(mailed)**
7. Recognize Recipients of Quality of Life Awards from American Society of Civil Engineers **(mailed)**
8. Report from Water Quality Board **(mailed)**
9. Prosecutor's Environmental Unit Report for June, 2008 **(mailed)**
10. S.W.I.M. Team Report for May, 2008 **(mailed)**
11. Information Re: Health Dept's. 9th Annual Lake St. Clair Assessment Report **(mailed)**
12. Approve Payment to Harrison Township from Environmental Problems: Lake/River Fund for Phragmite Control **(mailed)**
13. Authorize Health Department to Apply for U.S.E.P.A. Grant for Watershed Monitoring Activity **(mailed)**
14. Progress Report Re: Animal Shelter **(mailed)**
15. New Business
16. Public Participation
17. Adjournment

MEMBERS: **DeSaele-Chair, Camphous-Peterson-Vice-Chair, Rocca, J. Flynn, Roberts, Torrice, Switalski, Drolet, Rengert, Mijac, Brdak, Gieleghem, Doherty and Crouchman (ex-officio)**

RESOLUTION NO. _____ MEETING DATE: _____

AGENDA ITEM: _____

MACOMB COUNTY, MICHIGAN

RESOLUTION TO: Receive and file information about MCHD's incoming Director of Health Promotion/Disease Control, Janice Chang

INTRODUCED BY: Commissioner Philis DeSaele, Chairperson, Health Services Committee

On Monday, June 30, 2008, Janice Chang assumed her new responsibilities as Director of MCHD's Division of Health Promotion/Disease Control.

Dr. Chang has more than 15 years of experience in public health administration. Her career has included clinical practice and teaching, Medical Officer posts in two local health departments in Jamaica, a two-year position as Regional Epidemiologist for one of Jamaica's four Regional Health Authorities, and a year's work for the Pan American Health Organization/World Health Organization.

We are fortunate to have a person of Janice Chang's experience join our staff, and take pleasure in introducing her to you today.

Health Services - July 17, 2008

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PAPER

RESOLUTION NO. _____

MEETING DATE: _____

AGENDA ITEM: _____

MACOMB COUNTY, MICHIGAN

RESOLUTION TO: Recognize Public Works Director Anthony Marrocco, David Lakin, President of Spalding DeDecker Associates, and Ray Rose, President of Anderson, Eckstein and Westrick whose organizations received Quality of Life Awards from the American Society of Civil Engineers. The awards were presented in recognition of the $81.2 million Lake St. Clair Clean Water Initiative

INTRODUCED BY: Commissioner Philis DeSaele, Chairperson, Health Services Committee

An overview of the project will be presented.

Health Services --- July 17, 2008

Anthony V. Marrocco
Public Works Commissioner
Macomb County

Macomb Public Works, Engineers Win Coveted Environmental Award

For additional information contact Deputy Public Works Commissioner Gene Schabath at (586) 469-7424. For Immediate Release. June 27, 2008

The Macomb County Public Works Office --- and two well-known engineering firms -- were awarded Quality of Life Awards for an ambitious $81.2 million pollution abatement project in St. Clair Shores, Roseville and Eastpointe.

The American Society of Civil Engineers handed out the awards recently during a program that was appropriately held on the Diamond Jack tour boat along the Detroit River.

Plaques were handed out to Macomb County Public Works Commissioner Anthony V. Marrocco; David Lakin, president of Spalding DeDecker Associates, of Rochester Hills, and Roy Rose, president of Anderson, Eckstein and Westrick, of Shelby Township.

Commissioner Marrocco said it was appropriate that the awards ceremony was held during a cruise along the Detroit River.

"The Detroit River is a lot cleaner now," Commissioner Marrocco told the crowd of 50. "And we played a part it maker it cleaner."

Commissioner Marrocco was referring to the $81.2 million Lake St. Clair Clean Water Initiative, the comprehensive program to help abate pollution in Lake St. Clair.

The clean water initiative was a daunting challenge that included 36 separate projects, numerous companies, and took 6 1/2 years to complete. Planning and engineer work consumed another 5 1/2 years before the first shovel was put in the ground.

The project was petitioned by the city councils of St. Clair Shores, Roseville and Eastpointe under Chapter 20 of the state Drain Code. The cities are paying off the bonds issued to pay for the work.

"It is with great pride that we accepted the challenge of the clean water initiative," Commissioner Marrocco said. "It is part of our legacy of cleaner water and a cleaner environment. The quest for cleaner water is a legacy that can be traced back decades ago."

Commissioner Marrocco said that back in the 1960's the former Macomb County Drain Commission Office built the 28-million gallon Chapaton basin and a companion facility, the Martin Basin, also in St. Clair Shores, to alleviate basement flooding in the Shores, Roseville and Eastpointe (then known as East Detroit). The 8 ½ Mile Road Drain was also built at that time as part of the fight against water pollution.

distributed
7-17-08

"Then came the challenge that confronted us in the mid-1990's with new pollution problems," Commissioner Marrocco said. That led to the massive $81.2 million clean water initiative.

Here are the major projects completed under the initiative:

1. Construction of nearly six miles of new sanitary sewer and relief drains along Jefferson and also from 9 Mile Road to the Marter Road booster station in St. Clair Shores. That allowed for the elimination of five emergency bypass pumps installed in the 1960's to pump combined storm water and sewage into Lake St. Clair to prevent basement flooding.

The new sewers also allowed more capacity in the system "so it could handle up to a 10-year, one-hour storm without overflowing or causing basement backups" said Maria Sedki, an engineer with Spalding DeDecker. "It has to hold (the combined sewer flow) in the sewers and at the basin. Interceptor sewers were built along Jefferson Avenue to accomplish this.

2. Implementation of an overflow control program that made treatment of the combined sewer overflow more efficient that included settling of solid waste and a better disinfection method. It also called for an aeration system to add oxygen into the water to prevent the killing of fish when overflows occur.

3. Installation of throttling gates on the 9 Mile Drain and Martin Drain that now allow basin operators to control the flow in the system that reduced the overflows into Lake St. Clair.

4. About 150 damaged manholes and leaking sewer pipes were "rehabilitated" in all three communities which reduced the infiltration of ground water into the sewer system.

5. New control systems were built at Chapaton including a 3 million gallon overflow canal that expanded the detention capability at the basin. This prevented several overflows into Lake St. Clair. A state-of-the-art computer monitoring system has improved the efficiency of the system.

6. In northern St. Clair Shores, more than 1,000 manhole chimneys were reconstructed, 217 perforated covers plugged, or replaced and another 172 manhole frames adjusted --- all to reduce the volume of wet weather run off entering the sanitary lines.

7. About 2,700 feet of storm sewer was constructed along 10 Mile Road, from Cole to Hayes, in Eastpointe. Catch basins in the 10 Mile Road right-of-way that previously had been discharging into a combined sewer were redirected to a storm sewer.

8. Six main sewer projects were completed in Roseville in various areas. Most of the projects dealt with storm water run off and construction of storm sewers to help control deluges. Two of the projects entailed separation of catch basins. Catch basins had been connected to sanitary lines but were redirected to storm sewers.

9. About 650 feet of a concrete outfall that extended into Lake St. Clair was replaced. The total length of the outfall into the lake is 1,411 feet and if it hadn't been repaired, overflow would have been closer to shore.

The projects were financed through loans from the State Revolving Fund and the sale of bonds. Due to the size and complexity of the program, Commissioner Marrocco took the financial and administrative lead for the design and construction of the upgrades.

A special Intra-County Drainage Board was created for the Lake St. Clair Clean Water Initiative. Commissioner Marrocco chaired the board.

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RESOLUTION NO. _____ MEETING DATE: _____

AGENDA ITEM: _____

MACOMB COUNTY, MICHIGAN

RESOLUTION TO: Receive and file a report of the Macomb County Water Quality Board

INTRODUCED BY: Commissioner Philis DeSaele, Chairperson, Health Services Committee

The Macomb County Water Quality Board met on June 10, 2008. The Board passed a resolution asking congressional action to restore the historic scope of the Clean Water Act (CWA) preserve existing CWA exemptions such as those for agriculture and reduce regulatory uncertainty. Macomb County Health Department staff reviewed findings of the 2006 Lake St. Clair Assessment Report. In response to a request from Kalkaska County to support their resolution regarding "reasonable use of common water" the Board will communicate with state legislators urging strong water resources protection.

COMMITTEE / MEETING DATE

Health Services – July 17, 2008

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PAPER

RESOLUTION NO. _____ FULL BOARD MEETING DATE: 7/24/08

AGENDA ITEM:_____

MACOMB COUNTY, MICHIGAN

RESOLUTION TO receive and file the Status Report on the Prosecutor's Environmental Unit for June, 2008, as submitted by Luanne Laemmerman

INTRODUCED BY: Philis DeSaele, Chairman, Health Services Committee

COMMITTEE/MEETING DATE
Health Services 7/17/08

PROSECUTOR'S ENVIRONMENTAL UNIT REPORT
Submitted by Luanne Laemmerman

June 2008

CIVIL CASES:

See table attached.

CRIMINAL CASES:

People v Flansburgh – Defendant failed to pay third installment of restitution to Macomb County Lake/River Fund. MCPO sent letter to Defendant on 6/12/08 – no response. Court notified of Defendant's failure to pay restitution on 7/1/08.
People v Wierszewski – Rescheduled pretrial on 7/1/08. Defendant plead to lesser charge of solid waste violations with $2,000 restitution to Lake/River Fund. $2,000 payment received on 7/7/08.

MEETINGS ATTENDED ON BEHALF OF COUNTY:

6/10/08 – Water Quality Board
6/19/08 – Attended SEMCOG Workshop on Phase II Stormwater Permit

Monthly Narrative: Continued work with MCHD to determine status of all outstanding SWIM team cases and developed actions for appropriate personnel. Assisted Sheriff's Department/Marine Division regarding enforcement of barge and sunken vessel removal. Also assisted Marine Division with citizen complaint of potential illegal sewage disposal from moored boat on Clinton River. Pursued procedures to authorize warrants for violation of local health department regulations for outstanding IDEP offenders. Consulted with MDEQ regarding improper dredging and seawall construction case. Consulted with Sheriff's Department regarding investigation of gasoline spill.

Continued coverage at District Court/general criminal docket.

Future Plan: Attend Workshop regarding reducing phosphorus in urban watersheds and utilize information to determine necessity of County Fertilizer Ordinance. Evaluate preparation and tailoring of environmental training for local law enforcement to Macomb County, including potential individual training at local stations. Continue enforcement of outstanding SWIM team cases. Continue to explore ways to facilitate transfer of cases to Environmental Prosecutor. Continue to pursue designation as Special Asst. Attorney General with AG's office. Personally meet with Macomb County police chiefs to encourage environmental awareness and enforcement. Meet with City/Township Attorneys to coordinate enforcement and promotion of environmental cases. Participate in educational programs to facilitate healthy lawn care.

Macomb County Health Dept/EHS Open Cases

07/08/08

Date Referred to Prosecutor	Civil Division/ Street	Violation	Referral Source	Issue/Status
3/28/05	Clinton Twp/ Cass Avenue	Section 3.1 & 3.4 Sewage Code	MCHD SWIM Team	Sanitary waste plumbed to storm drain discovered 1/03 through dye test. Complaint filed 12/05. Order of Consent Judgment issued 12/19/05. No compliance with Order. Letter to owner on 10/30/07 to pursue proper connection in order to avoid enforcement of Consent Order. Second letter to owner on 11/26 to contact Clinton Twp Water & Sewer Dept by 12/7 to avoid enforcement. Owner contacted Clinton Twp as directed. MCPO contacted by owner's attorney. Owner and/or attorney unresponsive. **MCHD verifying alternative corrective action for property.**
3/10/04	Chesterfield/ 22 Mile Road	Section 3.1 & 3.4 Sewage Code	MCHD SWIM Team	Positive dye (sewage to county drain). Complaint filed 3/18/04. No show/Bench warrant - recalled. Case dismissed by court in 2004 for lack of progress. Letter informing owner of responsibility sent 10/31/07. Owner applied for and received permit from MCHD in 12/07. Meeting with owner on 1/23/08; owner signed agreement to complete repairs by 6/15/08 and to minimize water usage. Correspondence to owner on 4/4/08 to prepare timeline for repairs. **Repair work complete as of 7/8/08.**
12/28/05	Fraser/ 14 Mile Rd	Section 3.1 & 3.4 Sewage Code	MCHD SWIM Team	Failing septic system. Complaint filed 9/1/06. Order to show cause 9/25/06 – no show. Bench warrant 9/06. Case dismissed by A. Jacklyn 6/13/07 - defendant allegedly complied with sewer connection/started work. MCHD confirmed that connection not made as of 10/24/07. House sold on 12/19/06 - no POS conducted because purchased through foreclosure. 30-day letter sent to new owner on 12/26/07; no compliance, formal citation sent by MCHD on 3/5/08. Enforcement letter sent 4/25/08, correction by 6/15/08; owner currently getting repair estimates; **owner trying to get permission to tie into neighboring sanitary lines.**
2/15/06	Clinton Twp/ Elmway Rd	Section 3.1 & 3.4 Sewage Code	MCHD SWIM Team	Illicit connection. Property transferred to new owner who paid sewer tap and frontage fees. Enforcement letters sent to property owner. Connection to sanitary sewer allegedly begun as of 7/2/07 according to A. Jacklyn. Certificate of occupancy to be withheld until home is connected to sanitary sewer. **No action until owner applies for Certificate of Occupancy from Building Dept.**
12/06	Washington Twp/ Wicklow Hill	Section 3.1 & 3.4 Sewage Code	MCHD SWIM Team	Illicit connection. Enforcement letter sent 3/9/07. Hazard Abatement Affidavit extended to 6/30/07 – currently expired. Site consultation with MCHD on 11/21/07. Letter to owner on 12/12/07 to schedule installation of new system immediately. Follow up letter sent on 1/9/08 indicating that repairs must be complete by 6/15/08 and to minimize water usage. Owner signed agreement on 1/16/08 to complete repairs by 6/15/08 and to minimize water usage. Correspondence to owner on 4/4/08 to prepare timeline for repairs. Final enforcement letter send by MCPO on 6/3/08 due to lack of cooperation. **Repairs complete as of 6/20/08.**
7/15/04	Lenox Twp/ 31 Mile Rd	Section 3.1 & 3.4 Sewage Code	MCHD SWIM Team	Failing septic; citation 7/05; Consent Order 1/06 – repair to be complete by 6/06; no compliance; owner trying to get loan. Message left for owner to call Environmental Prosecutor on 10/31/07. No action by owner to date. Correspondence sent to owner on 1/8/08 to meet with MCHD and MCPO by 1/31/08 to develop schedule of compliance or enforce consent order. Agreement made on 1/24/08 with owner to complete repairs by 6/15/08 and to minimize water usage. Final enforcement letter send by MCPO on 6/3/08 due to lack of cooperation. **MCPO authorizing warrant.**
3/07	Clinton Twp/ Little Rd	Section 3.1 & 3.4 Sewage Code	MCHD SWIM Team	Malfunctioning septic system found 4/06. Citation 6/06. Hazard Abatement Affidavit necessary due to site conditions. Owner failed to pursue final permitting. Letter sent from MCPO to owner on 3/9/07 – no compliance. Correspondence sent to owner on 1/7/08 to meet with MCHD and MCPO regarding options. Agreement made on 1/24/08 with Owner to complete repairs by 6/15/08 and to minimize water usage. Correspondence to owner on 4/18/08 re: failure to comply with agreement – file civil or criminal complaint if no cooperation. **MCPO authorizing warrant.**

Macomb County Health Dept/EHS Open Cases

07/08/08

Date Referred to Prosecutor	Civil Division/ Street	Violation	Referral Source	Issue/Status
	Chesterfield Twp/ Fairchild	Section 3.1 & 3.4 Sewage Code	MCHD SWIM Team	MCHD to manage file – house currently unoccupied; **bank informed of standing violation.**
8/14/07	Lenox	Section 3.1 & 3.4 Sewage Code	MCHD SWIM Team	Failing septic; wastewater is discharging to the roadside ditch. Owner has not responded to letters regarding alternate septic installation locations. Enforcement letter sent 8/23/07. MCHD confirmed that home owned by the bank; no active discharge; **MCHD sent notification letter to bank of standing violation on 12/21/07.**
4/2/08	Clinton Twp/North Ave	Section 3.1 & 3.4 Sewage Code	MCHD SWIM Team	Failing septic; citation to owner 3/20/06; sanitary sewers available for connection; owner claiming hardship; Enforcement letter/proof of hardship sent by MCPO 4/17/08; **foreclosure proceedings in process – no enforcement of violation.**
4/15/08	Warren/Van Dyke	Section 3.1 Sewage Code	MCHD SWIM Team	Discharge of sewage to storm drain; Notice of Violation from Warren 12/4/06; MCHD citation sent 3/7/08; no response from owner; letter from MCPO ordering correction by 6/9/08; **Cease and Desist Order by City of Warren on 5/9/08 – returned undeliverable; owner verbally warned by MCPO on 7/8/08 to proceed with correction within one week or face escalation of enforcement.**
4/1/08	Warren/ Mound	Section 3.1 Sewage Code	MCHD SWIM Team	Discharge of sewage to storm drain; citation sent 11/13/07; no response from owner; letter from MCPO ordering correction by 6/9/08; Cease and Desist Order by City of Warren on 5/9/08; **contract is in place for repairs – start date of 7/22/08 – MCPO to monitor progress.**
4/22/08	**Armada/ Armada Ridge**	**Section 3.1, 3.4 & 5.1 Sewage Code**	**MCHD SWIM Team**	**Complaint received by MCHD 8/07; dye test confirmed illicit discharge 8/07; violation letter sent 10/07; owner issued permit 9/07; Citation sent 12/07 for lack of compliance; final letter from MCHD 4/08 – case sent to MCPO; repairs completed 6/08.**
5/29/08	**Harrison Twp/ Pineridge**	**undetermined**	**MCHD SWIM Team**	**Complaint received by MCHD 4/08; dye test attempted 4/08; three letters requesting access to dye test sent 4/08-5/08; case referred to MCPO; letter to owner from MCPO directing contact with MCHD to schedule inspection 6/08; owner complied 6/08.**
7/2/08	**Shelby Twp/ Barclay**	**undetermined**	**MCHD SWIM Team**	**Complaint received by MCHD 5/08; dye test attempted 5/08 – no entry granted; two letters requesting access to dye test sent 5/08-6/08; case referred to MCPO 7/08.**
7/2/08	**Lenox Twp/ Gratiot**	**Section 3.1, 3.4 & 3.6 Sewage Code**	**MCHD SWIM Team**	**Complaint received by MCHD 8/07; dye test confirmed illicit discharge 9/07; two violation letters sent by MCHD 9/07-11/07; order to connect to sanitary sewer sent by MCHD 1/08; Citation issued for lack of compliance 3/08; various contact with property owner 3/08-6/08; no progress on connection as of 6/08; case sent to MCPO 7/08.**

Key: bold text indicates latest activity.

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RESOLUTION NO. _____

MEETING DATE: _____

AGENDA ITEM: _____

MACOMB COUNTY, MICHIGAN

RESOLUTION TO: Receive and file the Surface Water Improvement and Monitoring (SWIM) Team report for May 2008.

INTRODUCED BY: Commissioner Philis DeSaele, Chairperson, Health Services Committee

The May 2008 Surface Water Improvement and Monitoring (SWIM) Team report summarizes surface water monitoring, bathing beach monitoring, investigatory and educational activities of the SWIM Team for the month of May 2008.

COMMITTEE/MEETING DATE

Health Services – July 17, 2008

MACOMB COUNTY HEALTH DEPARTMENT
ENVIRONMENTAL HEALTH SERVICES DIVISION
SURFACE WATER IMPROVEMENT AND MONITORING "SWIM" TEAM
MONTHLY REPORT MAY 2008

Mission: Monitoring, educational, investigatory and enforcement activities toward achieving the goal of all Macomb County surface waters being in compliance with full body contact standards.

Surface Water Monitoring: 61 sampling locations were monitored this month for *E. coli* indicator bacteria. The monitoring for May 2008 indicates that 85 % of the sampling locations show improvement over the historical May data. See the attached data summary.

Bathing Beach Monitoring: Monitoring for the 2008-bathing season resumed April 16, 2008 for Blossom Heath Beach and Memorial Park Beach in St. Clair Shores, Metropolitan Beach in Harrison Township, New Baltimore Beach in New Baltimore and the two inland beaches at Stony Creek Metropark in Washington Township. Beaches are monitored twice weekly for compliance with the Total Body Contact Standards contained in Part 125 of the Michigan Public Health Code (P.A. 368, 1978).

Monitoring for the Month of May 2008 (Beaches officially opened Memorial Weekend)

( ) No Closures at any Beaches.
(X) Closures at the following Beaches:

	Days Closed	Yearly Total
( ) New Baltimore Park	0	0
( ) Metro Beach Metro Park	0	0
( ) SCS Memorial Park	0	0
(X) SCS Blossom Heath Park	1	1
( ) Stony Creek Baypoint	0	0
( ) Stony Creek Eastwood	0	0

SWIM Team Investigations:

	May 2008	Year-To-Date
Investigations Initiated	10	39
Cases Referred to Prosecutors Office	1	8
Investigations Resolved		25
Open Cases Year to Date: 2008	14	
Open Cases from 2007	17	
Open Cases from 2006	8	
Open Cases from 2005	6	
Open Cases from 2004	6	
Open Cases from 2003	5	
Open Cases from 2002	0	
Open Cases from 2001	1	

*Investigations are initiated by citizen complaint, municipal referral or as an outcome of water quality monitoring results.

Education and Public Information:

Displays were set up at the Health Department's offices in Mt. Clemens, Warren and St. Clair Shores for Water Quality Month. Twenty-one Water Quality and Household Hazardous Waste presentations were given to 790 students at the following locations:

4th Grade	Lobbestael Elementary School	Harrison Township
4th Grade	South River Elementary School	Harrison Township
8th Grade	Anchor Bay Middle School	New Baltimore
4th Grade	Will Lee Elementary School	Richmond
4th - 6th Grade	Morgan Elementary School	Shelby Township
5th & 6th Grade	Messmore Elementary School	Sterling Heights

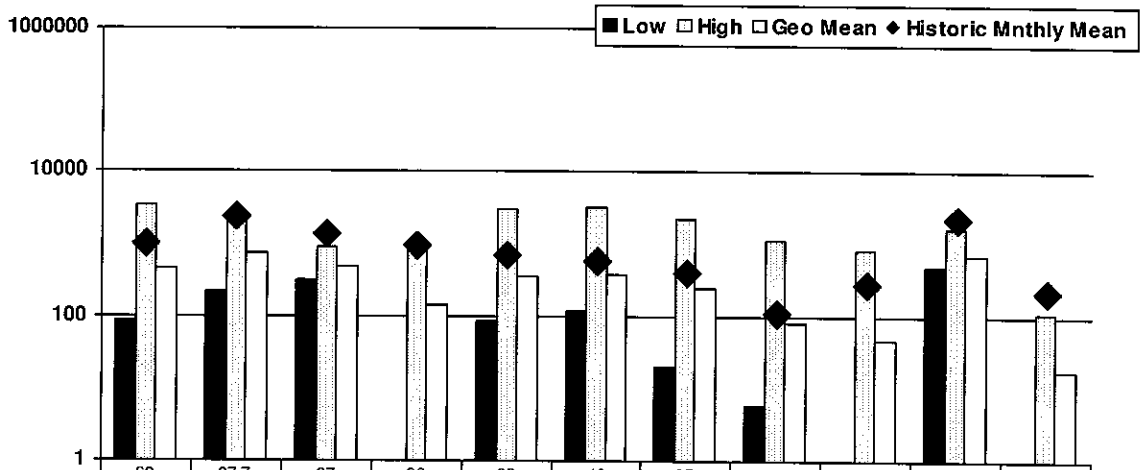
MACOMB COUNTY HEALTH DEPARTMENT
ENVIRONMENTAL HEALTH SEVICES DIVISION
SURFACE WATER IMPROVEMENT AND MONITORING "SWIM" TEAM
MONTHLY REPORT FOR MAY 2008

SWIM TEAM INVESTIGATIONS

Municipality	May-08 Investigations Initiated	May-08 Year To Date
Armada Township	0	1
Armada Village	0	0
Bruce	0	0
Center Line	0	0
Chesterfield	0	1
Clinton	1	9
Eastpointe	0	0
Fraser	0	0
Harrison	4	4
Lenox	0	0
Macomb	0	0
Memphis	0	0
Mt. Clemens	0	0
New Baltimore	0	0
New Haven	1	1
Ray	0	1
Richmond Township	0	1
Richmond City	0	0
Romeo	0	1
Roseville	0	1
St. Clair Shores	0	0
Shelby	4	17
Sterling Heights	0	1
Utica	0	1
Warren	0	0
Washington	0	0
Total #	10	39

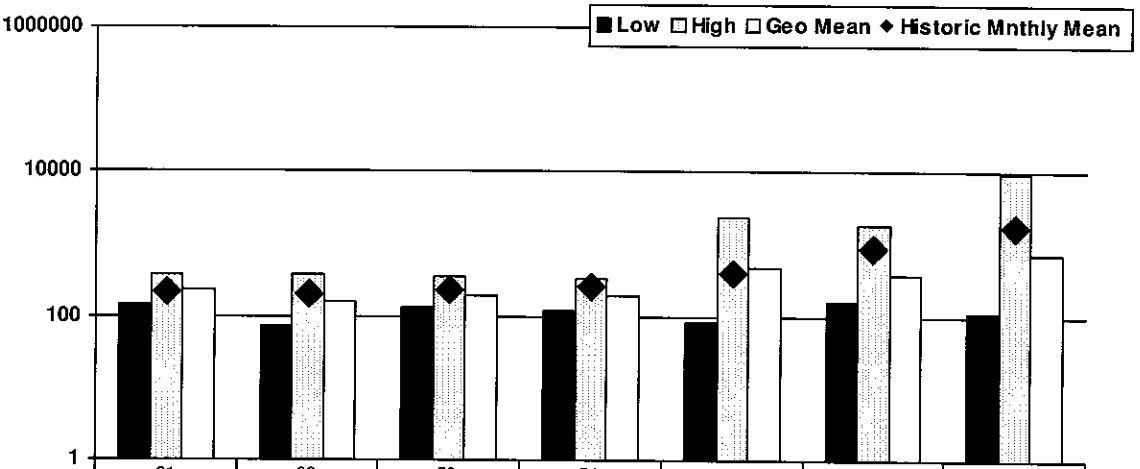
Macomb County Health Department
Environmental Health Services Division
Monthly Compare Results
5/1/2008 -5/31/2008

Clinton River Main Branch Watershed-EAST



	68	67.7	67	96	83	40	95	41	43	61.2	42
Low	86	216	317	1	86	120	20	6	1	472	1
High	3448	2489	886	1039	3076	3130	2247	1119	839	1585	109
Geo Mean	454	739	474	140	349	385	251	80	48	702	18
Historic Mnthly Mean	1027	2332	1334	928	713	577	399	109	271	2227	213

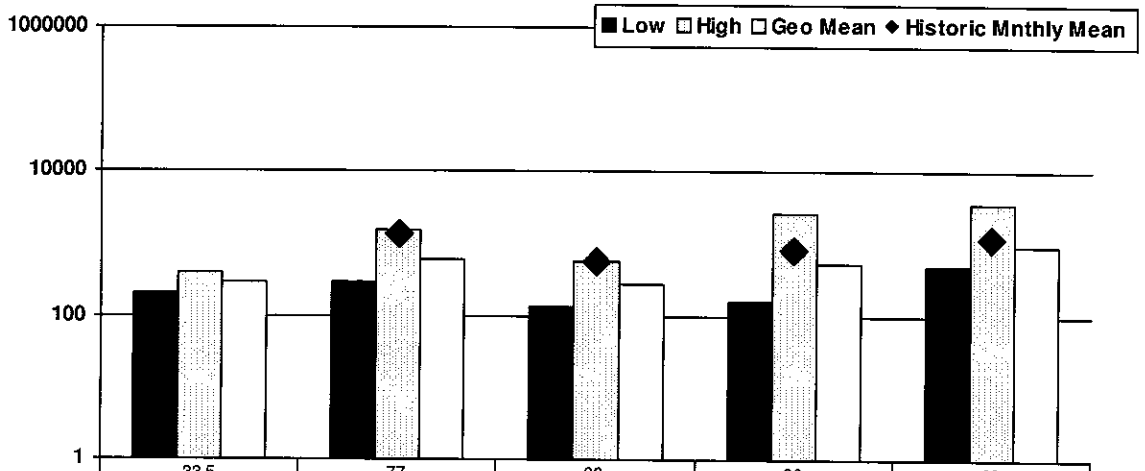
Clinton River Main Branch Watershed-WEST



	91	92	53	54	62	75	69
Low	145	74	134	121	84	158	109
High	384	368	364	336	2382	1842	9804
Geo Mean	228	163	191	195	477	379	751
Historic Mnthly Mean	221	207	233	257	397	859	1730

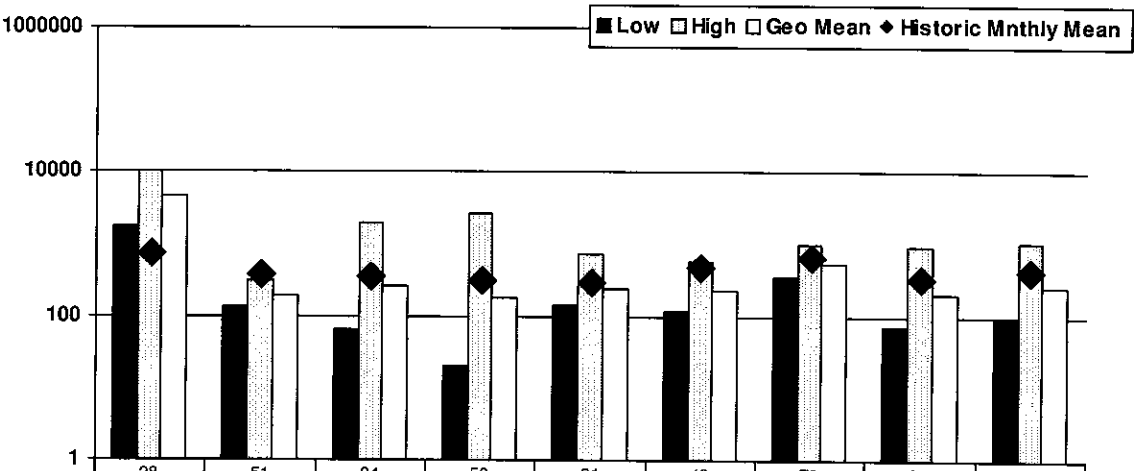
Macomb County Health Department
Environmental Health Services Division
Monthly Compare Results
5/1/2008 -5/31/2008

Clinton River Middle Branch Watershed



	33.5	77	33	60	63
Low	201	295	134	159	521
High	410	1553	571	2723	3654
Geo Mean	287	601	285	530	957
Historic Mnthly Mean		1379	572	849	1189

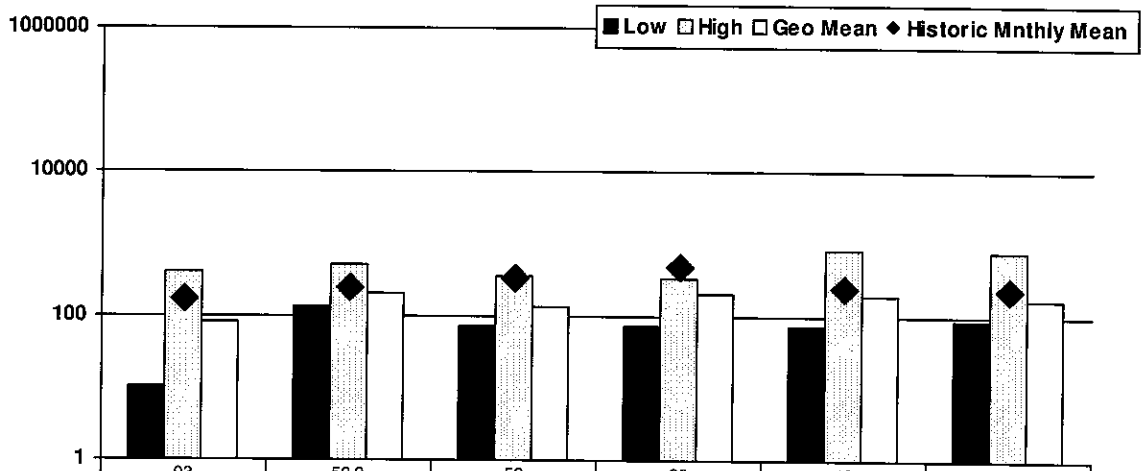
Clinton River North Branch Watershed-EAST



	28	51	34	50	31	48	76	36	44
Low	1723	134	63	20	142	118	350	74	98
High	10462	314	2014	2613	748	571	990	932	1046
Geo Mean	4615	192	258	176	241	232	530	198	256
Historic Mnthly Mean	743	383	348	313	288	467	653	342	429

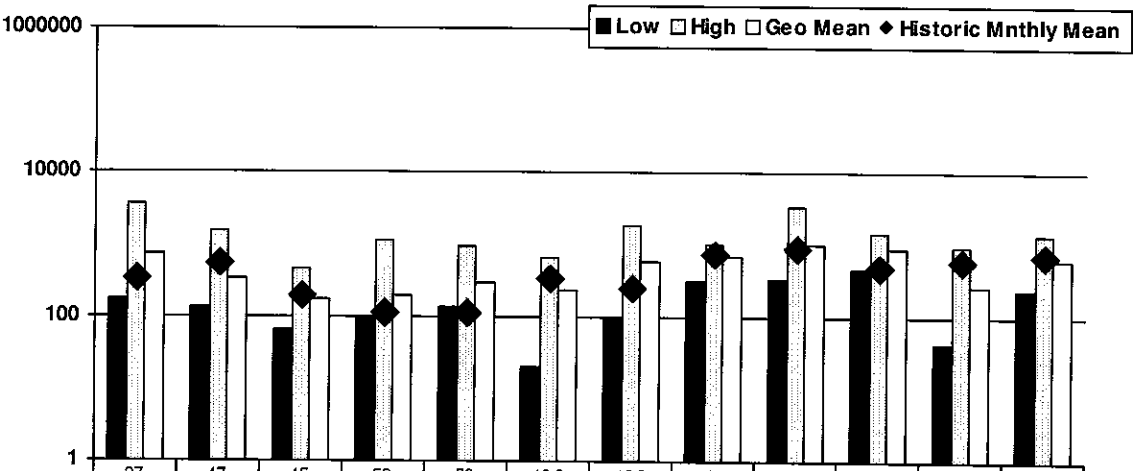
Macomb County Health Department
Environmental Health Services Division
Monthly Compare Results
5/1/2008 -5/31/2008

Clinton River North Branch Watershed-WEST



	93	52.2	52	29	49	30
Low	10	134	74	74	74	86
High	410	504	350	323	839	798
Geo Mean	80	204	135	203	187	175
Historic Mnthly Mean	165	250	336	474	239	228

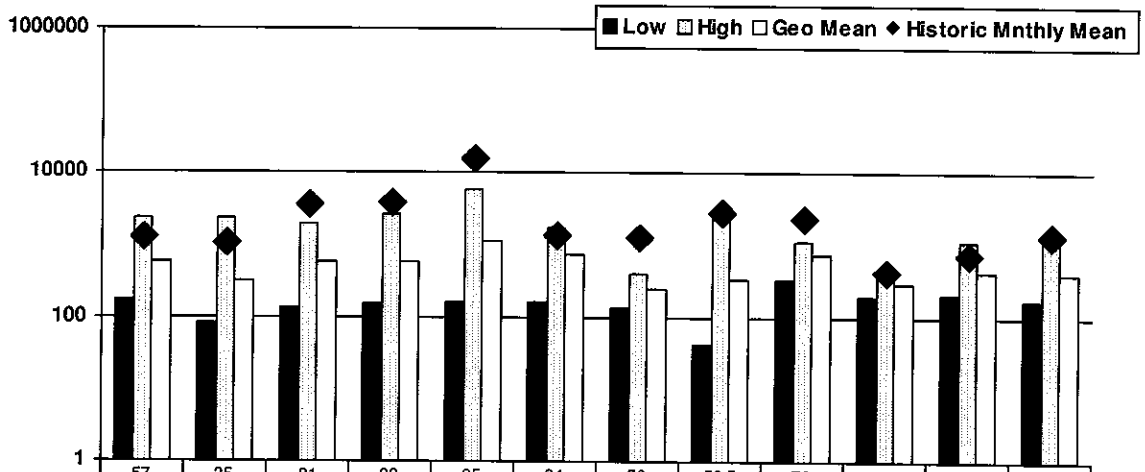
Other: Salt River, Milk River, Crapauo Creek



	37	47	45	58	59	46.2	46.3	46.6	46.7	46	39.1	38
Low	171	131	63	97	131	20	96	305	323	450	41	228
High	3609	1565	464	1100	959	669	1860	988	3448	1401	934	1354
Geo Mean	747	324	168	194	288	230	589	710	1011	906	264	612
Historic Mnthly Mean	342	529	190	113	109	326	251	722	873	491	575	697

Macomb County Health Department
Environmental Health Services Division
Monthly Compare Results
5/1/2008 -5/31/2008

Red Run Drain/Bear Creek Watershed



	57	35	81	82	85	84	56	56.5	72	71.8	71	55
■Low	169	84	135	148	155	160	134	41	332	189	203	173
□High	2359	2359	1918	2602	5794	1785	399	3282	1112	471	1130	1354
□Geo Mean	575	305	587	585	1148	751	241	327	758	288	430	403
◆Historic Mnthly Mean	1272	1087	3545	3733	15294	1338	1264	2758	2306	423	735	1371

Macomb County Health Department
Environmental Health Services Division
Retention Basin/Combined Sewer/Sanitary Sewer Overflows
5-1-2008 through 5-31-2008

Start	Start Time	End	End Time	Hours	Gallons	Receiving Water	Meets NPDES	Precipi-tation	Type
Total all locations					0				

5 HIGHEST E. COLI SURFACE WATER SAMPLING SITES
(May, 2008)

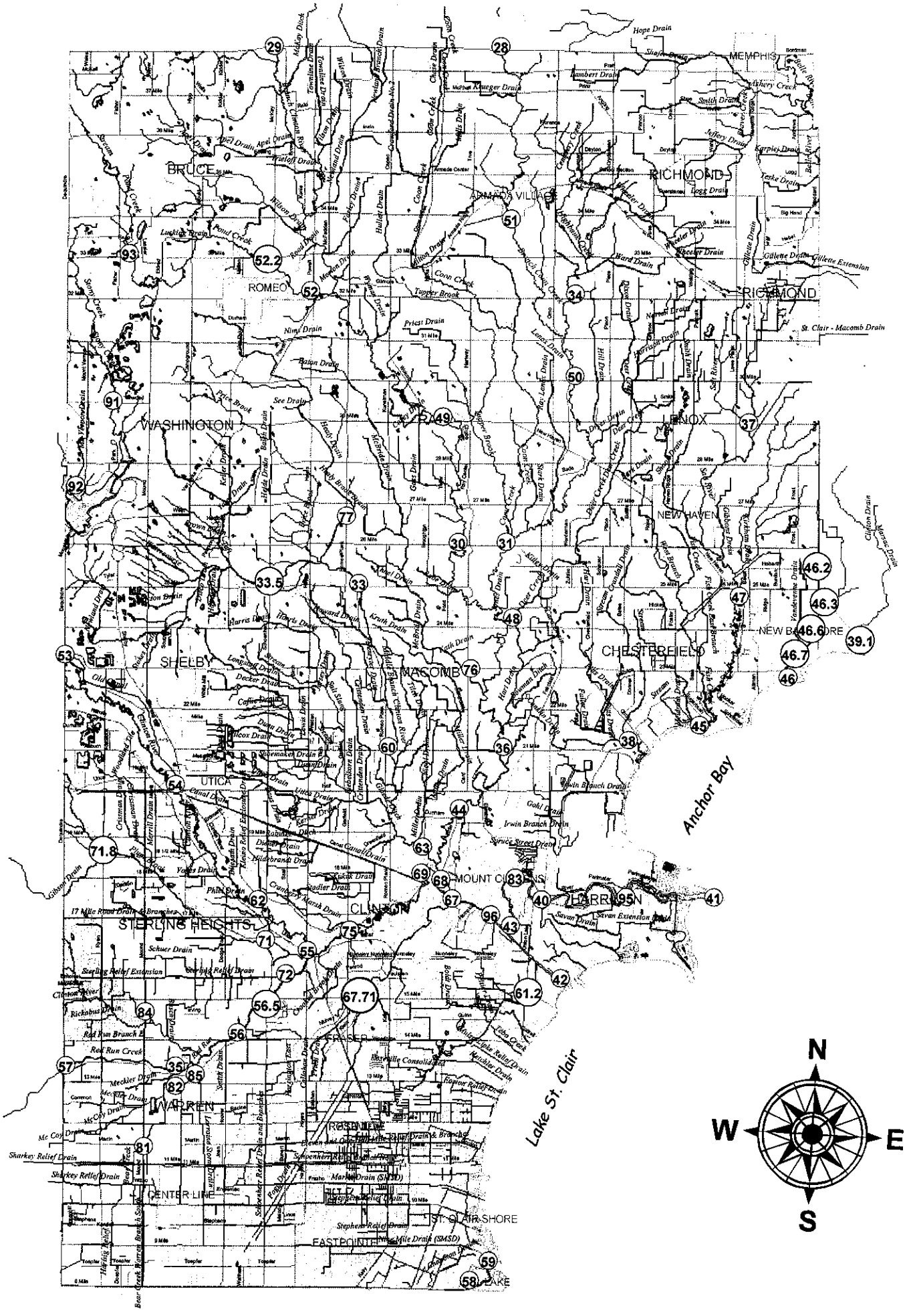
	Sample #	Location	E. coli/100 mL (Geo Mean)
1	28	East Brach Coon Creek at Boardman Rd.	4,615
2	85	Lorraine Drain at Bear Creek	1,148
3	46.7	Crapeau Creek at Ashley	1,011
4	63	Middle Branch Clinton River At Heydenreich	957
5	46	Crapeau Creek at Main St.	906

MACOMB COUNTY HEALTH DEPARTMENT
ENVIRONMENTAL HEALTH SERVICES DIVISION
SURFACE WATER IMPROVEMENT AND MONITORING "SWIM" TEAM
SURFACE WATER SAMPLING SITES

Sample #	Location
	Clinton River Main Branch Watershed - EAST
68	Clinton River at Moravian Rd. Bridge
67.71	Sweeney Drain at 15 Mile Rd.
67	Harrington Drain at Harrington Rd.
96	Clinton River Spillway at Shadyside Park Bridge
83	Clinton River at Mt. Clemens YMCA Dock
40	Clinton River at I-94
95	Clinton River at Albatross Docks
41	Clinton River at DNR Site
43	Clinton River Spillway at the Weir
61.2	Clinton-Harrison Relief Drain At Shook Rd.
42	Clinton River Spillway at Jefferson Ave.
	Clinton River Main Branch Watershed - WEST
91	Stoney Creek at Inwood Rd.
92	Stony Creek West Branch at Stony Creek Rd.
53	Clinton River at Dequindre Rd.
54	Clinton River at Auburn Rd.
62	Clinton River at Kleino Rd.
75	Clinton River at Garfield Rd.
69	Canal Drain at Clinton River Rd.
	Clinton River Middle Branch Watershed
33.5	Middle Branch Clinton River at Schoenherr Rd.
77	Healy Brook Drain at Romeo Plank Rd.
33	Middle Branch Clinton River at 25 Mile Rd.
60	Middle Branch Clinton River at 21 Mile Rd.
63	Middle Branch Clinton River at Heydenreich Rd.
	Clinton River North Branch Watershed - EAST
51	East Branch Coon Creek at North Ave.
34	Highbank Drain at 32 Mile Rd.
50	East Branch Coon Creek at 30 Mile Rd.
31	East Branch Coon Creek at 26 Mile Rd.
48	Deer Creek at North Ave.
76	McBride Drain at Card Rd.
36	North Branch Clinton River at 21 Mile Rd.
44	North Branch Clinton River at Little St.
28	East Branch Coon Creek at Boardman Rd.
	Clinton River North Branch Watershed - WEST
93	East Pond Creek at 33 Mile Rd.
52.2	East Pond Creek at M-53
52	East Pond Creek at Powell St.
29	North Branch Clinton River at Boardman Rd.
49	North Branch Clinton River at 29 Mile Rd.
30	North Branch Clinton River at 26 Mile Rd.

MACOMB COUNTY HEALTH DEPARTMENT
ENVIRONMENTAL HEALTH SERVICES DIVISION
SURFACE WATER IMPROVEMENT AND MONITORING "SWIM" TEAM
SURFACE WATER SAMPLING SITES

Sample #	Location
	Other: Salt River, Milk River, Crapeau Creek
37	Salt River at 29 Mile Rd.
47	Salt River at Washington St.
45	Salt River at Jefferson Ave.
58	Milk River at Alger St.
59	Milk River at Clairwood St.
46.2	County Line Road Drainage Ditch at Hobarth Rd.
46.3	Crapeau Creek at County Line Rd.
46.6	Vanderbenne Drain at Fox Point St.
46.7	Crapeau Creek at Ashley St.
46	Crapeau Creek at Main St.
39.1	Marsac Drain at M-29
38	River Voss at Jefferson Ave.
	Red Run Drain/Bear Creek Watershed
57	Red Run Drain at Dequindre Rd.
35	Red Run Drain at Van Dyke Ave.
81	Bear Creek at Mound Rd.
82	Bear Creek at Old 13 Mile Rd.
85	Lorraine Drain at Bear Creek
84	Beaver Creek at Mound Rd.
56	.Red Run Drain at 14 Mile Rd
56.5	Schoenherr Relief Drain at Red Run Drain
72	Sterling Relief Drain behind Freedom Hill Park
71.8	Plumbrook Drain at Ryan Rd.
71	Plumbrook Drain at Schoenherr Rd.
55	Red Run Drain at Utica Rd.


BRUCE
WASHINGTON
ROMEO
ARMADA VILLAGE
RICHMOND
RICHMOND
MEMPHIS
LENOX
NEW HAVEN
CHESTERFIELD
NEW BALTIMORE
SHELBY
MACOMB
UTICA
STERLING HEIGHTS
CLINTON
MOUNT CLEMENS
HARRISON
FRASER
WARREN
ROSEVILLE
CENTER LINE
ST. CLAIR SHORES
EASTPOINTE
LAKE
Anchor Bay
Lake St. Clair
N
W
E
S

RECYCLABLE
PAPER

RESOLUTION NO. _____ MEETING DATE: _____

AGENDA ITEM: _____

MACOMB COUNTY, MICHIGAN

RESOLUTION TO: Receive and file information from MCHD's ninth annual Lake St. Clair Assessment Report

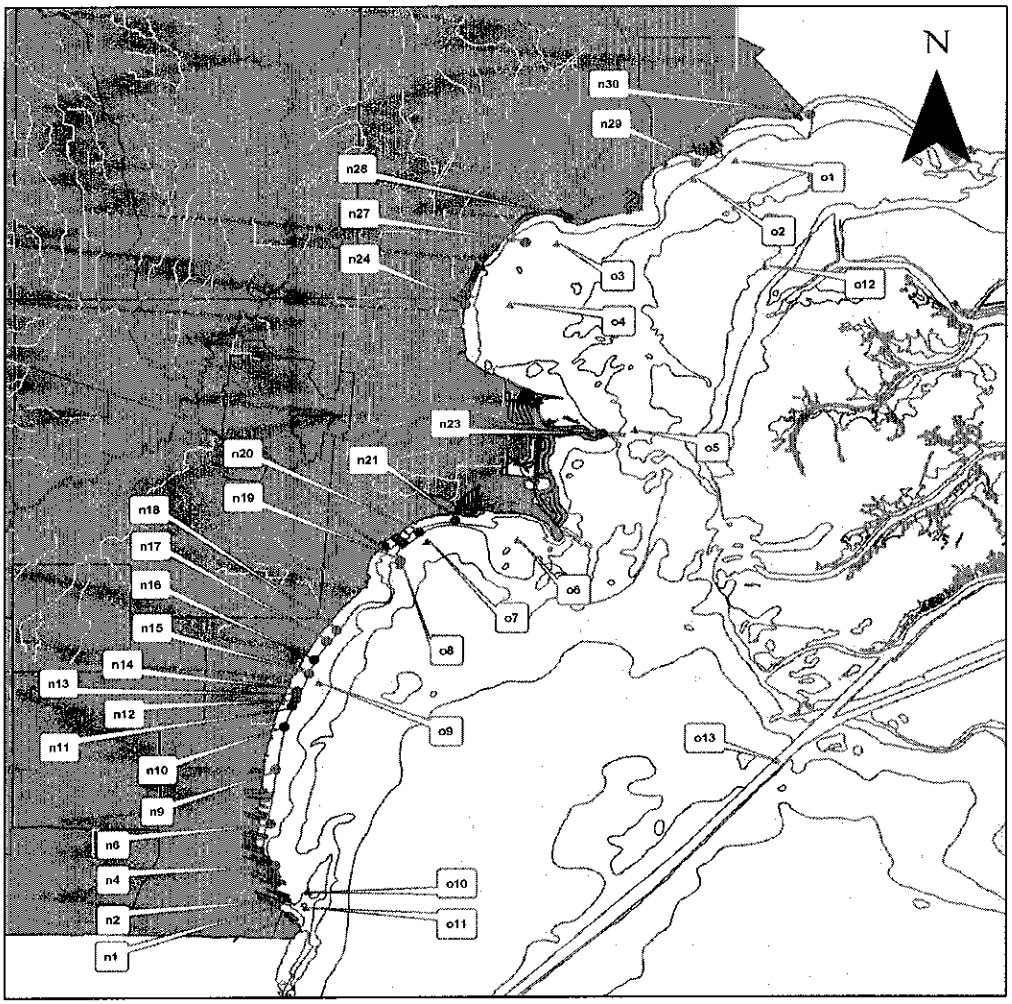
INTRODUCED BY: Commissioner Philis DeSaele, Chairperson, Health Services Committee

A representative from the Health Department will give a brief presentation of selected findings from the most recent Lake St. Clair Assessment.

Health Services - July 17, 2008

MACOMB COUNTY HEALTH DEPARTMENT
Environmental Health Services Division

2006 LAKE ST. CLAIR WATER QUALITY ASSESSMENT



FUNDING FOR THIS PROJECT WAS PROVIDED BY THE MACOMB COUNTY BOARD OF COMMISSIONERS

Gary White, Environmental Health Services, R.S., M.S., Director
Stephen Lichota, Environmental Health Services, Associate Director
Cole Shoemaker, M.P.H., R.S., Project Supervisor
James Buzonik, M.S., Water Quality Analyst

distributed
7-17-08

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Key Findings in the 2006 Lake St. Clair Assessment
(See cover for sample site locations)

The annual geometric mean did not exceed the 30 day Total Body Contact Standard of 130 *E. coli* CFU/100 mL at any Lake St. Clair sample site during 2006, nor did the geometric mean for all Lake St. Clair sample sites exceed this standard during any individual sampling event. The highest Lake St. Clair sample site annual *E. coli* geomean was 123 *E. coli* CFU/100 mL at the Clinton River (n23).

The 2006 average annual nitrate level (1.3 mg/L) at the Clinton River (n23) was twice the 2005 average annual nitrate level (0.67 mg/L) at this site and more than twice the level (0.50 mg/L) of the next highest site, the Salt River (n28). Historically, the levels of nitrate at the Clinton River (n23) correlate significantly with total phosphorous, but they do not correlate with any rainfall levels, as measured at Selfridge Air National Guard Base. This finding does not support the fertilizer runoff explanation for the high nitrate levels at this site.

Statistically significant downward trends in aqueous mercury levels were noted at the Clinton River (n23) and the Milk River (w58).

A statistically significant downward trend in *E. coli* concentration at the Mt. Clemens Water Treatment Plant Intake (o7) was noted from 1998 to 2006.

Lead and PNA levels decreased dramatically from 2005 levels in the sediment at the Clinton River at Moravian (w68).

The highest PNA level detected in this year's Lake St. Clair assessment, 26 mg/kg PNA, was found at the Stephens Relief Drain (n4). This site also demonstrated the highest annual levels for ten other sediment chemistry parameters, lead, zinc, cadmium, chromium, arsenic, nickel, ammonia, chemical oxygen demand, total organic carbon, and PCBs, ever found at this site.

PCBs were detected at Milk River (n1), Liberty Drain (n2), Stephens Relief Drain (n4), Martin Drain (n6), Clinton River Spillway (n19), and Bear Creek at Old 13 Mile Rd. (w82).

A statistically significant correlation between aqueous *E. coli* and foreshore sand *E. coli* was found at Blossom Heath Beach between 2004 and 2006.

Levels of dissolved oxygen and pH were found to be directly correlated at the Clinton River (n23) and Irwin Branch Relief Drain (n24).

A statistically significant decrease in turbidity was observed at the Irwin Branch Relief Drain (n24) from 1998 to 2006.

The concentrations of sIX different sediment metals exceeded regulatory guidelines at Red Run at Utica Rd. (w55). This is the greatest number of exceedances for any watershed sample site.

INTRODUCTION

The Clinton River Watershed encompasses most of Macomb and Oakland Counties, with small portions extending into Lapeer and St. Clair Counties. It drains approximately 760 square miles, an area which is populated by an estimated 1.5 million persons, before reaching Lake St. Clair. The majority of the land within the watershed is developed for industrial, urban and suburban uses. Although agriculture is still common along the North Branch of the Clinton River, farmland is diminishing rapidly due to urban expansion. Since urban expansion alters natural drainage, an increasing amount of water reaches Lake St. Clair via storm water systems.

The water flowing through Lake St. Clair is a precious natural resource that provides drinking water for millions, numerous recreational opportunities and is essential to the businesses and homeowners adjacent to the shoreline. Notwithstanding the importance of Lake St. Clair, many water quality problems exist. In 1985, the International Joint Commission designated the lower Clinton River basin as an Area of Concern, due to elevated fecal coliform bacteria, total dissolved solids levels, contaminated sediments, and a degraded benthic macroinvertebrate community. During the 1990's, the Macomb County Health Department frequently closed beaches on Lake St. Clair due to violations of total body contact standards for indicator bacteria. Early in 1997, Macomb County established the Blue Ribbon Commission on Lake St. Clair to develop an action plan addressing water quality issues. Monitoring water and sediment quality was the first of four key elements the Commission listed as necessary in solving the problems facing Lake St. Clair.

The water quality concerns in Lake St. Clair and the Clinton River Watershed include pathogens, toxic contaminants and eutrophication. Historically, the primary reason for water pollution control was the prevention of waterborne disease. Humans can acquire bacterial, viral or parasitic disease through direct contact or drinking contaminated water. Today, the discharge of sewage to the lake from many sources continues, along with the associated risk of human exposure to many pathogenic organisms.

Toxic contaminants include man-made organic chemicals and heavy metals that can be acutely poisonous in small amounts and injurious through chronic exposure in minute concentrations. Human exposure can result from direct contact with contaminated water or sediment, or indirectly through the food chain. The danger of toxic substances was first illustrated with the study of the persistence, bioaccumulation and effects of DDT in the environment. Currently, fish consumption advisories exist on Lake St. Clair to reduce human exposure to several toxic pollutants.

Urbanization increases the amount of nutrients and organic material entering the lake. This increased loading can quicken the aging process of a lake, known as eutrophication, through excessive plant growth and oxygen depletion. Eutrophication reduces the biodiversity in the lake, replacing the natural inhabitants with a smaller variety of less desirable species of plants and animals.

STUDY DESIGN

A water quality monitoring program was conducted on Lake St. Clair and the Clinton River Watershed during the spring, summer and fall of 2006. The overall purpose of this project was to collect data and characterize water and sediment quality in the Lake and Watershed.

The project included five complementary monitoring activities; near shore, off shore, watershed, bathing beach and wet weather. The near shore testing was conducted at 23 major inputs to the lake, including the mouths of the Clinton River and Spillway, urban storm drains, smaller rivers and creeks and retention basin discharge points. Near shore sampling was conducted adjacent to the outfalls, however, many samples were collected further from the outfalls than during previous years due to lower lake levels. Off shore sampling was conducted at 13 sites. Seven of the off shore locations corresponded to major near shore sample locations, two were adjacent to public beaches, two were municipal drinking water intake sites and the mouths of the North and South Channel. Water chemistry samples were collected during the spring, summer and fall seasons at 20 near shore and all off shore sites. Aqueous bacteriological samples and water quality meter readings (temperature, dissolved oxygen, conductivity, pH and turbidity) were collected weekly from April 29 to September 15 at all 23 near shore sites. Off shore water bacteriology testing and water quality meter readings were collected during the spring, summer and fall seasons. Sediment *E. coli* samples were collected during the summer and fall from 9 near shore and 7 off shore sites. Sediment chemistry samples were collected at 13 near shore locations. Aqueous samples for trace mercury analyses were collected at ten sites on the lake and six sites in the watershed.

Concurrent sediment and water samples were collected at 14 locations in the watershed for bacteriological examination during the spring, summer and fall. Sediment chemistry samples were collected at 5 locations. Water chemistry samples were collected at five locations during wet and dry weather conditions.

Bathing beach water and sediment sampling was conducted at 15 sites on the public beaches along Lake St. Clair (Blossom Heath, Memorial Park, HCMA Metropark, and New Baltimore). The sampling was performed at locations established for the Bathing Beach Water Quality Monitoring Program. Samples were collected monthly from July through September, and analyzed for water and sediment bacteriology.

Event sampling was conducted in the watershed in response to rain events exceeding one half inch in a 24-hour period. Water samples were collected for bacteriological analysis at 20 strategic locations between April and September. Sample locations were selected based on three criteria: proximity to known sewer overflows, locations of frequently high bacteria counts and at the most downstream sample site of each major sub-watershed drainage area of the Clinton River.

Appendix A identifies the specific locations of the sample sites. The sampling plan can be found in Appendix B.

METHODS

Sample Locations and Designations

Sample locations were marked and replicated with Global Positioning System (GPS) equipment. A Trimble GPS Pathfinder Pro XR, which utilizes real-time differential correction and has submeter accuracy, was employed to digitize sample locations and for navigation to sample locations. The sample locations were digitized into the U.S. State Plane Michigan New South NAD-27 coordinate system (Appendix A). When navigating to near shore sites, once the site was visually located the boat approached the site as water levels would permit. Sample locations were numbered and pre-fixed "n" for near shore, "o" for off shore and "w" for watershed.

Sample Collection, Analytical Methods and Quality Assurance

Sample collection procedures, laboratory analytical methods and data quality assurance measures are detailed in the Quality Assurance Project Plan, which is available at the Macomb County Health Department.

Sample Analysis

PCB, pesticide, PAH, total petroleum hydrocarbon, oil and grease, total organic carbon, chemical oxygen demand, biochemical oxygen demand, nitrate, ammonia, kjeldahl nitrogen, total phosphorus, ortho-phosphorus, sediment *E. coli,* chloride, aluminum, arsenic, cadmium, chromium, copper, lead, zinc, mercury and nickel analyses were conducted at Trace Laboratories, Inc.

Aqueous *E. coli* analysis was conducted at the Macomb County Martha T. Berry Medical Care Facility Laboratory.

Conductivity, turbidity, pH, dissolved oxygen, salinity, and water temperature data was collected with a Horiba U-22 or W-23 Water Quality Meter.

Selfridge Air National Guard Base (SANGB) provided climatological data (Appendix C).

Values below the reportable detection limit (RDL) were reported as one (1.0) if a geometric mean was derived from the data, otherwise a zero was reported. RDL values varied among parameters and sample runs. Specific RDL values are referenced in the QA/QC report provided by the laboratories. The abbreviations "ns" and "nd" were used to indicate no sample or no data respectively.

Statistical Methods

Average: A statistical measure describing the central tendency of a set of data points, calculated by dividing the sum of the data points by the number of data points in the data set.

Geometric Mean: A statistical measure calculated by the n^{th} root of the product of n factors.

Correlation Analysis: A statistical method used to measure the degree of association between two sets of data, resulting in a correlation coefficient, or r-value. Correlation coefficient values near 1 indicate a strong positive association, values near –1 indicate a strong inverse association and values near zero indicate no association.

F-test: A statistical test that determines whether the variances among groups of sample data are greater than those within the groups of sample data.

Probability (p): Indicates the likelihood of an incorrect statistical conclusion. For example, if the $p<0.05$ the likelihood is less than five percent, a significant result. A $p<0.01$ is 99% certain and said to be a very significant result.

Simple Linear Regression: A statistical method used to determine the relationship between a single dependent (response) variable and a single independent (predictor) variable by fitting a line through a set of observations. An R^2 value is calculated, indicating the predictive power of the regression relationship. The alpha (α) value refers to the desired level of confidence of the test. The p-value refers to the level of confidence of the test conclusion.

Standard Deviation: A statistical measure used to measure the dispersion around the average of a set of data points.

t-test: A statistical method used to determine if differences in the means of data sets are significant or due to chance.

z score: A statistical measure describing a data point in terms of standard deviations from the average of the data set. Calculated as the individual value minus the average value divided by the standard deviation of the data set.

Data for each parameter is summarized by sample date and sample site using basic descriptive statistics including average, standard deviation, maximum, minimum, range, z score, and in some cases, geometric mean.

Comparisons of data sets were conducted using t-tests (α= 0.05) when the data sets were normally distributed and Mann-Whitney tests when Kalmagorov-Smirnov results indicated that the data sets were not normally distributed. Trends were analyzed using correlation of the analytical parameter against time, using the Microsoft date range as the abscissa. Associations between physical, chemical, bacteriological data, and climatological data were evaluated using correlation analysis. A simple linear regression predicting bacteriological data by rainfall data was created (α = 0.05). Rainfall data was required to equal or exceed 0.10 inch before inclusion in the historical precipitation data set.

Data analysis was conducted using Microsoft Excel 7.0 and SPSS 13.0.

RESULTS

Aqueous Chemistry (Appendix D)

Water chemistry data (nitrate, TKN, ammonia, ortho-phosphate, total phosphorus, BOD, TOC, chloride and aluminum) was collected in Lake St. Clair at 20 near shore and 13 off shore sites during the summer and fall. The data is summarized by parameter in Appendix D, by season in Appendix E and by site in Appendix F.

Water chemistry data was also collected in the Clinton River Watershed at five locations. Samples were collected once during dry conditions and once during wet conditions.

Nitrate

Nitrate (NO_3^-): Plant nutrient; source of nitrogen which is needed to build protein. The most oxidized form of nitrogen. Derived from the natural breakdown of nitrogenous organic material, agricultural run-off or the discharge of sewage. Levels above 0.3 mg/L may stimulate excessive algal growth if phosphorus is not limiting.

The average annual nitrate concentration exceeded the critical value of 0.3 mg/L at the Clinton River (n23), the Salt River (n28), the Clinton River Spillway (n19), the north and south channel sites (o12 and o13), and Irwin Branch Relief Drain (n24). The nitrate concentration (1.3 mg/L) at the Clinton River (n23) was more than twice as high as that at the Salt River (n28) (0.50 mg/L). The lowest average annual nitrate concentration (0.090 mg/L) was found at the Milk River off shore site (o11) (Chart 1).

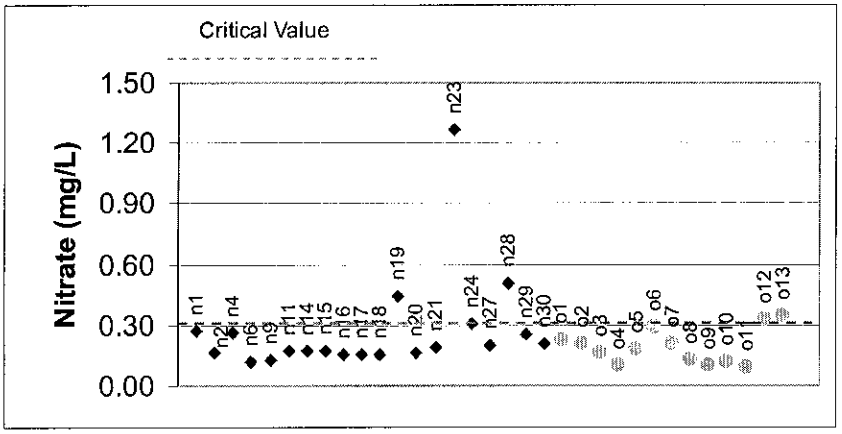


Chart 1: Spatial distribution of Lake St. Clair sample site average annual nitrate concentrations

In the watershed samples, the highest nitrate concentration (4.3 mg/L) occurred in dry weather at site w55, Red Run at Utica Road. The lowest nitrate concentration (0.056 mg/L) was found at site w43, Clinton River Spillway at the Weir, also in a dry weather sample (Chart 2).

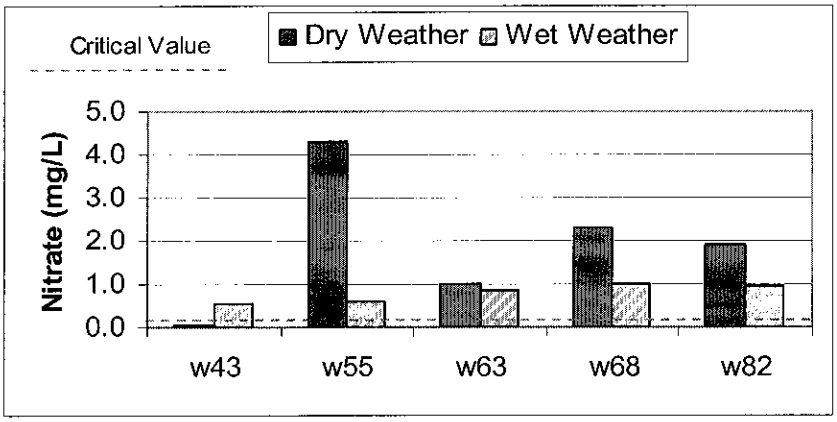


Chart 2: Watershed sample site nitrate concentrations

Total Kjeldahl Nitrogen

Total Kjeldahl Nitrogen (TKN): TKN is a measure of non-bioavailable nitrogen forms; ammonia and organic nitrogen. These forms may become bioavailable if oxidized by natural processes. Kjeldahl nitrogen may result from municipal and industrial discharges, fertilizer runoff, or natural bio-reduction. In sediments, TKN concentrations between 1000 mg/kg and 2000 mg/kg (dry weight) suggest moderate pollution, while levels greater than 2000 mg/kg indicate serious pollution.

The Lake St. Clair sample site with the highest annual average TKN concentration (1.0 mg/L) was Salt River (n28). The lowest annual average TKN concentration (0.11 mg/L) was found at North Channel (o12) (Chart 3).

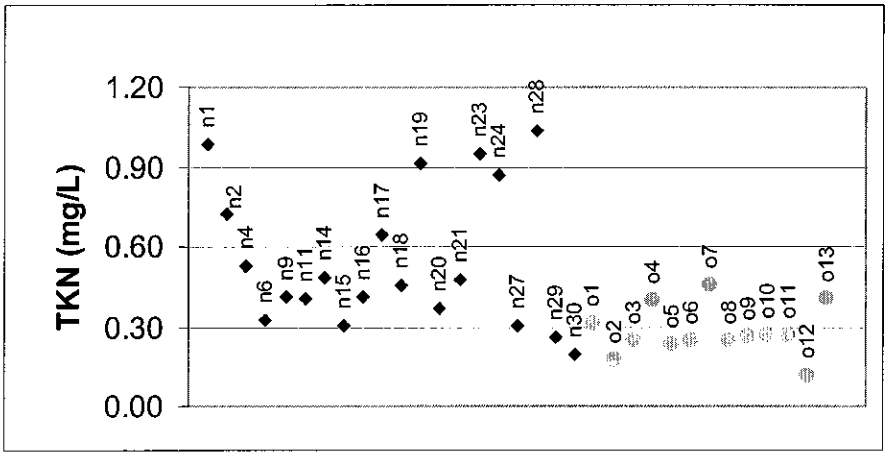


Chart 3: Spatial distribution of Lake St. Clair sample site average annual TKN concentrations

In the watershed samples, the highest TKN concentration (3.1 mg/L) occurred at Bear Creek at Old 13 Mile Rd. (w82), in a wet weather sample. The lowest TKN concentration (1.3 mg/L) was found at the same site in a DRY weather sample (Chart 4).

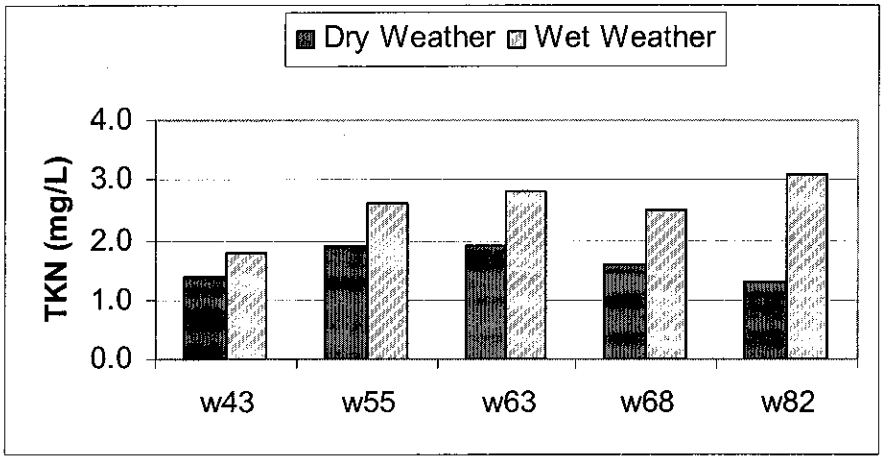


Chart 4: Watershed sample site TKN concentrations

Ammonia

Ammonia (NH_3): Plant nutrient; source of nitrogen, which is needed to build protein. Ammonia in aquatic systems is derived from the natural breakdown of nitrogenous organic material, or as a result of industrial discharge. Aqueous concentrations above 0.2 mg/L may indicate pollution. In sediments, ammonia concentrations between 75 mg/kg and 200 mg/kg (dry weight) suggest moderate pollution, while levels greater than 200 mg/kg indicate serious pollution.

The only Lake St. Clair sample site with an average annual ammonia concentration above the critical value of 0.20 mg/L was Milk River (n1) at 0.25 mg/L. The lowest average annual ammonia concentration (0.034 mg/L) was found at Venter DeBueff Drain (n21) (Chart 5).

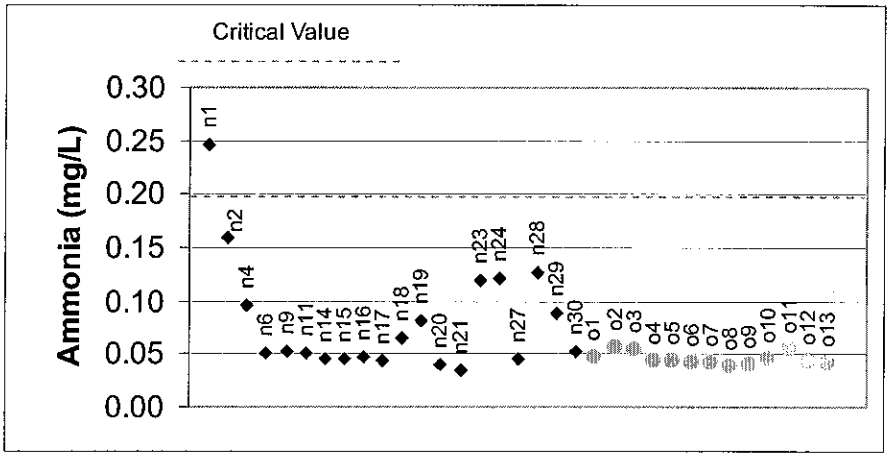


Chart 5: Spatial distribution of Lake St. Clair sample site average annual ammonia concentrations

In the watershed samples, the highest ammonia concentration (0.43 mg/L) was found in a wet weather sample from Bear Creek at Old 13 Mile Rd. (w82). The lowest ammonia concentration (0.058 mg/L) was detected in a dry weather sample from Clinton River Spillway at the Weir (w43) (Chart 6).

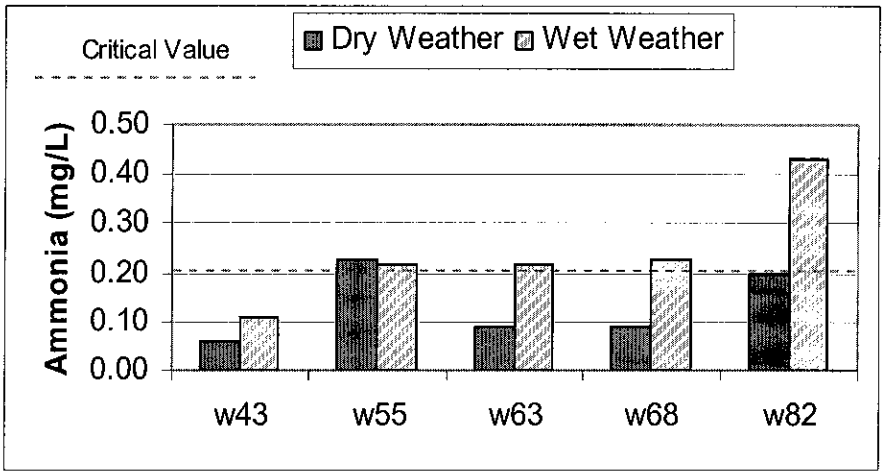


Chart 6: Watershed sample site ammonia concentrations

Orthophosphate

Orthophosphate: The anions PO_4^{-3}, HPO_4^{-2}, and $H_2PO_4^{-}$. These are the simplest forms of phosphorus found in aquatic systems. Since algae readily consume them, they are usually found in low concentrations.

The highest average annual orthophosphate concentration (0.042 mg/L) in the Lake St. Clair samples was found at the Clinton River (n23). 27 samples had average annual orthophosphate concentrations beneath the reportable detection limit (Chart 7).

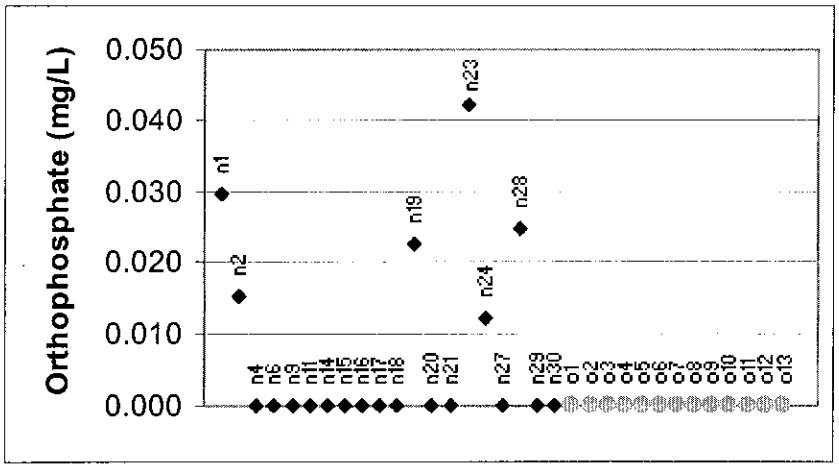


Chart 7: Spatial distribution of Lake St. Clair sample site average annual orthophosphate concentrations

In the watershed, the highest orthophosphate concentration (0.31 mg/L) was observed at Red Run at Utica Rd. (w55) in a dry weather sample. No detectable orthophosphate was found at the Clinton River at Heydenreich (w63) in either the wet weather or dry weather samples (Chart 8).

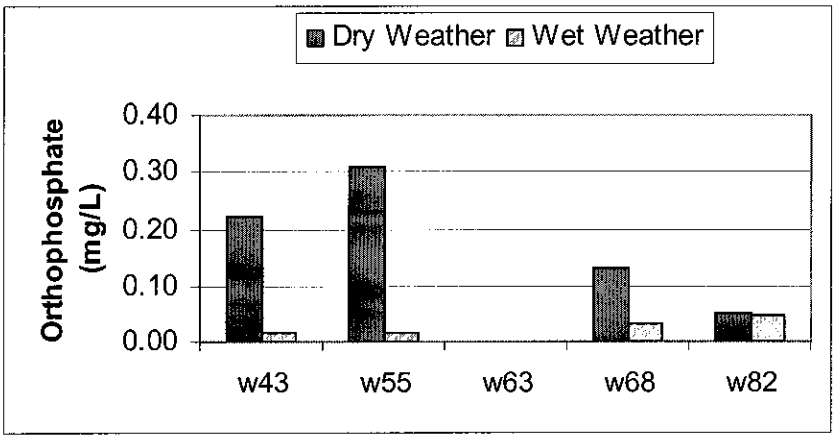


Chart 8: Watershed sample site orthophosphate concentrations

Total Phosphorus

Total Phosphorus: Essential plant nutrient, which is usually in short supply in aquatic systems. Therefore, it often serves as a limiting factor for algal growth. Found in fertilizers and detergents. It is desirable to have levels <0.05 mg/L. The discharge limit is 1 mg/L.

The Lake St. Clair site with the highest annual average total phosphorous concentration (0.12 mg/L) was the Clinton River (n23). Salt River (n28), Milk River (n1), Clinton River Spillway (n19), Irwin Branch Relief Drain (n24), and Liberty Drain (n2) all had annual average total phosphorous concentrations above the critical value for total phosphorous, which is 0.050 mg/L. The only Lake St. Clair sample site with a total phosphorous concentration beneath the reportable detection limit was South Channel (o13) (Chart 9).

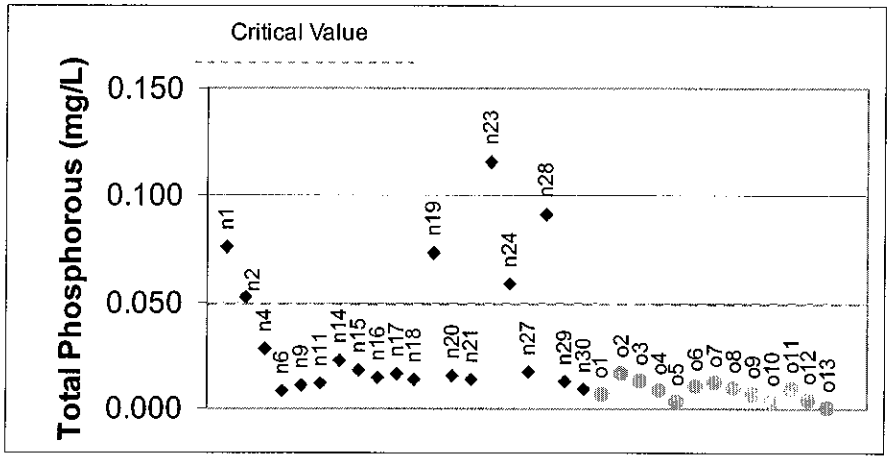


Chart 9: Spatial distribution of Lake St. Clair sample site average annual total phosphorus concentrations

Among the watershed samples, the highest total phosphorus value (0.40 mg/L) was found in the dry weather sample taken from Red Run at Utica Rd. (w55). The lowest total phosphorus value (0.049 mg/L) was found at the Clinton River Spillway at the Weir (w43), also in a dry weather sample. This was the only watershed sample that did not exceed the critical value for total phosphorus (0.050 mg/L) (Chart 10).

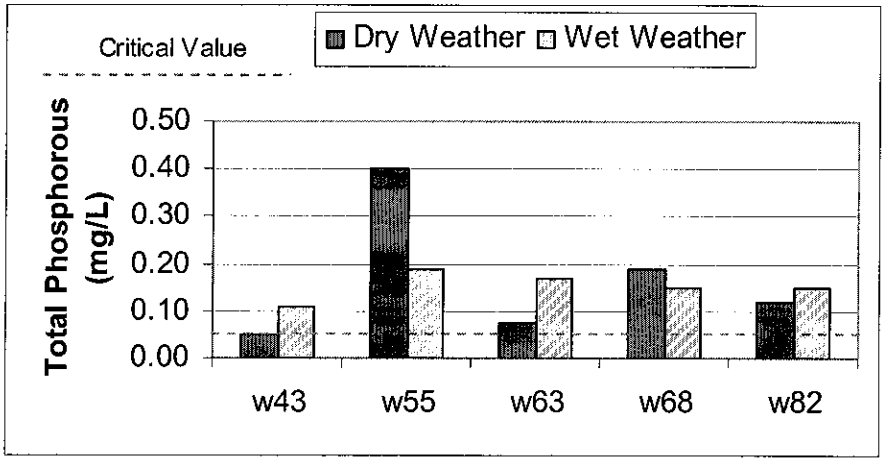


Chart 10: Watershed sample site total phosphorus concentrations

Biochemical Oxygen Demand

Biochemical Oxygen Demand: A measure of the amount of organic material in the body of water that is available for decomposition by aerobic (oxygen-consuming) microbiological processes. Clean water will have a BOD less than 1 mg/L. Values exceeding 4 mg/L may indicate pollution. Values greater than 10 mg/L are indicators of serious pollution.

The Lake St. Clair sample site with the highest annual average biochemical oxygen demand (BOD) was Clinton River Spillway (n19) at 0.90 mg/L. No Lake St. Clair sample site had a BOD exceeding the critical value of 4.0 mg/L. Twenty-six sample sites had BOD values below the reportable detection limit (Chart 11).

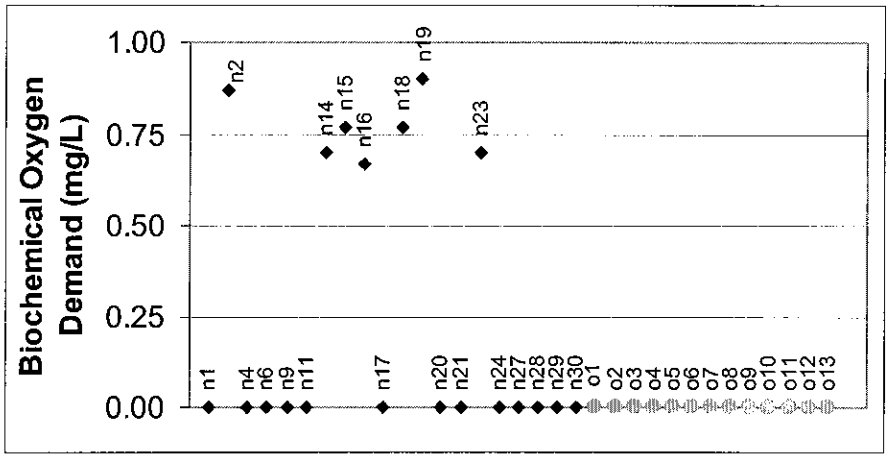


Chart 11: Spatial distribution of Lake St. Clair sample site annual average BOD concentrations

In the watershed, the highest average annual BOD (8.4 mg/L) was found in a wet weather sample at Bear Creek at Old 13 Mile Rd. (w82). The BOD at the Clinton River at Moravian (w68) was beneath the reportable detection limit for both the wet and dry weather samples for the second consecutive year.

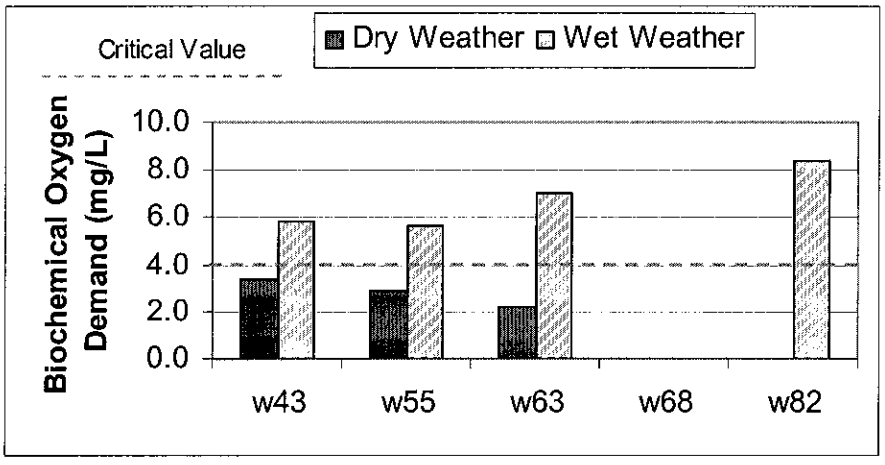


Chart 12: Watershed sample site BOD concentrations

Total Organic Carbon

Total Organic Carbon (TOC): TOC is a measure of the oxidizable carbon available in a water sample. It includes aromatic hydrocarbons, non-biodegradable organic carbon, straight chain aliphatic hydrocarbons, and organic nitrogen. As TOC increases, the trophic status of the lake moves toward eutrophication as respiration increases and dissolved oxygen levels decrease.

The Lake St. Clair sample site with the highest annual average total organic carbon (TOC) was Irwin Branch Relief Drain (n24), at 7.0 mg/L. This was almost exactly the same as the TOC value for this site last year, 7.2 mg/L. The lowest annual average TOC value (1.8 mg/L) was found at the North Channel (o12) (Chart 13).

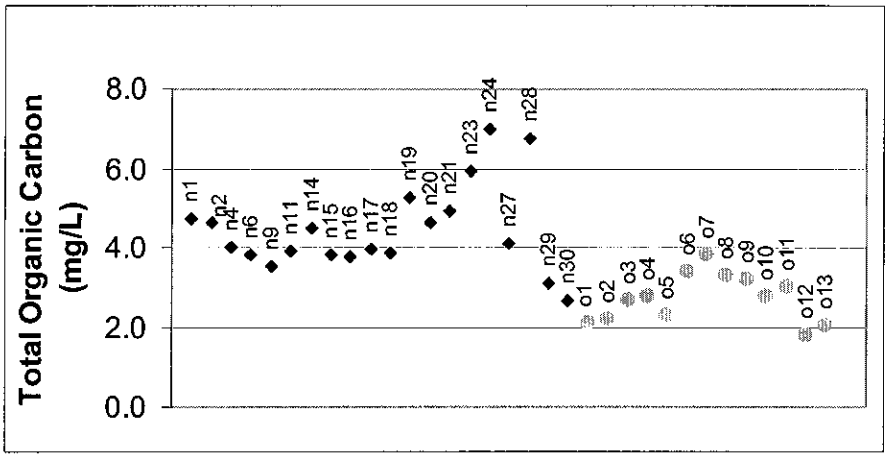


Chart 13: Spatial distribution of Lake St. Clair sample site annual average TOC concentrations

Among the watershed samples, the highest total organic carbon value (21 mg/L) was found in a wet weather sample taken from the Bear Creek at Old 13 Mile (w82). The lowest total organic carbon value (6.9 mg/L) was found at the Clinton River at Heydenreich (w68) in a dry weather sample (Chart 14).

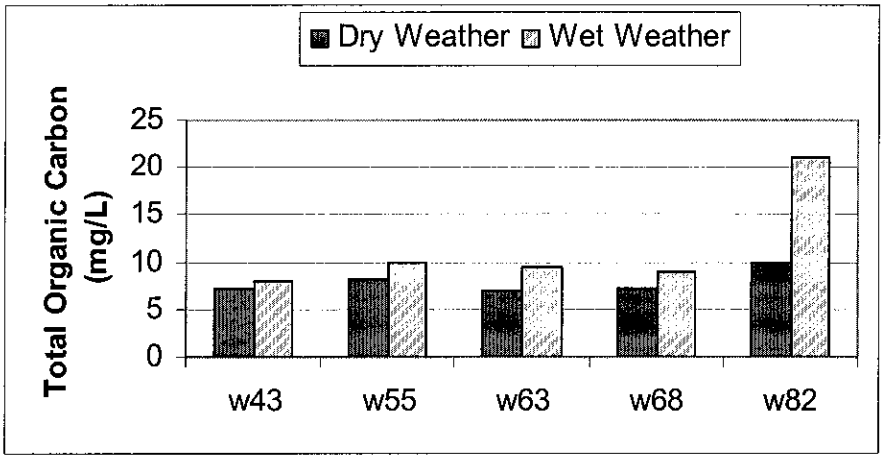


Chart 14: Watershed sample site TOC concentrations

Chloride

Chloride: An inorganic ion found in all natural waters. May be naturally occurring or from human uses in agriculture, industry and road de-icing. Michigan Water Standards state "The waters of the state designated as a public water supply source shall not exceed 125 milligrams per liter of chlorides as a monthly average, except for the Great Lakes and connecting waters, where chlorides shall not exceed 50 milligrams per liter as a monthly average." The critical values are therefore 50 mg/L for the Lake St. Clair Sample sites and 125 mg/L for the watershed sample sites.

The Lake St. Clair sample site with the highest annual average chloride concentration was the Clinton River (n23), at 97 mg/L. The lowest annual average chloride concentration (8.1 mg/L) was found at the North Channel (o12) (Chart 15).

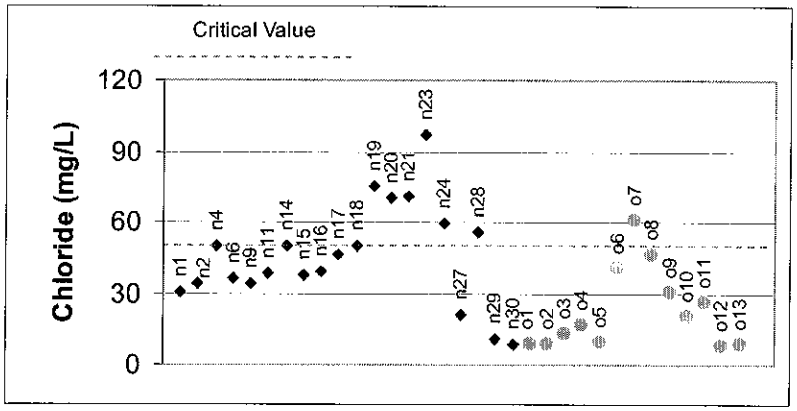


Chart 15: Spatial distribution of Lake St. Clair sample site annual average chloride concentrations

In the watershed samples, the highest chloride concentration (740 mg/L) was found in the dry weather sample from the Bear Creek at Old 13 Mile Road (w82). The lowest chloride concentration (120 mg/L) was found at the Clinton River at Moravian (w68) (Chart 16). Note that the critical values for chloride are different for the watershed (125 mg/L) and Lake St. Clair (50 mg/L) sample sites.

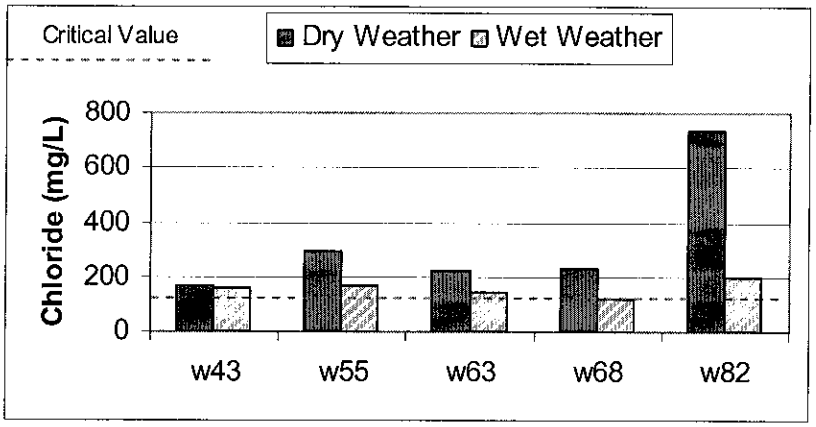


Chart 16: Watershed sample site chloride concentrations

Aqueous Mercury

Mercury: Mercury is a naturally occurring element found in air, water, soil and rocks. Total mercury can be subdivided into three chemical forms: elemental, inorganic and organic. It is a persistent pollutant that bioaccumulates in the food chain. Mercury is a potent neurotoxin. In Michigan, there is a special fish consumption advisory for all inland lakes due to mercury. The water quality criterion for wildlife protection is 1.3 ng/L, and for the protection of public health (via fish consumption) is 1.8 ng/L. The OMOE Low Effect Level for sediments is 0.2 mg/L (see Table 1 on page 22).

The Lake St. Clair sample site with the highest aqueous mercury concentration (3.1 ng/L) was Irwin Branch Relief Drain (n24). The watershed site with the highest aqueous mercury concentration (7.6 ng/L) was Lorraine Drain at Bear Creek (w85). The aqueous mercury levels at Clinton River Spillway (n19), Crapeau Creek (n29), and North Channel (o12) were beneath the reportable detection limit (Chart 17).

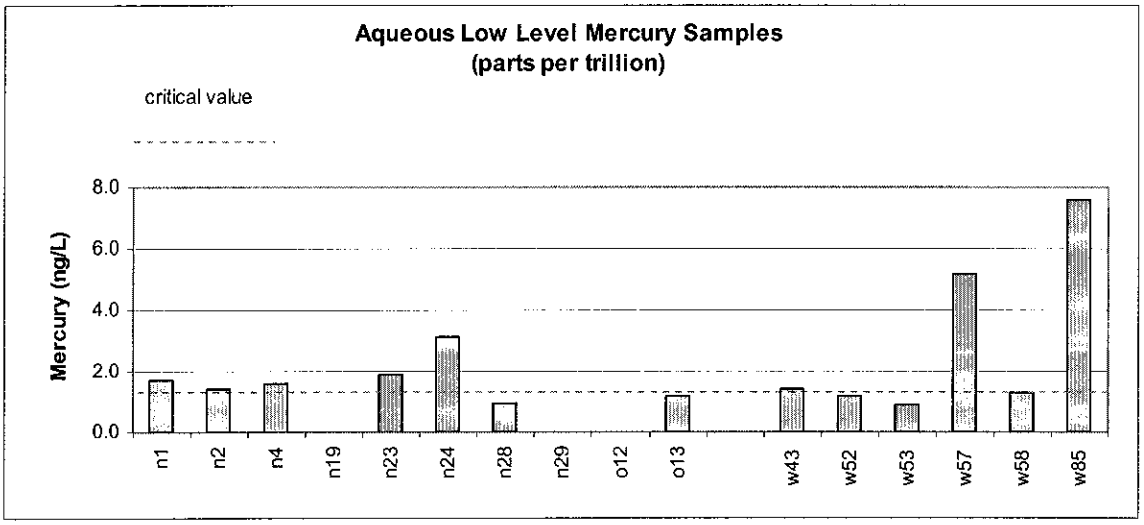


Chart 17: Low level aqueous mercury concentrations

Sediment Chemistry (Appendix G)

Sediment samples were collected at thirteen near shore and five watershed sample sites. The samples were analyzed for total Kjeldahl nitrogen (TKN), ammonia, total phosphorous, total organic carbon (TOC), chemical oxygen demand (COD), arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc, polychlorinated biphenyls (PCBs), polynuclear aromatic hydrocarbons (PNAs) and pesticides.

The sites were sampled in triplicate in an effort to evaluate the variation in the pollutant concentrations at each site. The triplicate data was analyzed in several ways. Results were expressed as an average of the three samples taken, and further evaluated by calculating the relative percent difference, a method also used for assessing duplicate samples for quality control purposes. "Highest" and "lowest" on the following pages refer to average values, not to individual measurements.

It appears that both the substance itself and the sample location influence the distribution of a given substance in sediments. Certain substances appear to be more evenly distributed than others. The distribution of substances also varied greatly between sample locations. Several factors may influence the distribution of substances in sediments, including the chemical nature of the substance, the make-up of the sediment, and the currents in the water above the sediment.

Further sampling should provide a better understanding of this issue and permit one to identify trends in pollutant concentrations over time.

Total Kjeldahl Nitrogen

Total Kjeldahl Nitrogen (TKN): TKN is a measure of non-bioavailable nitrogen forms; ammonia and organic nitrogen. These forms may become bioavailable if oxidized by natural processes. Kjeldahl nitrogen may result from municipal and industrial discharges, fertilizer runoff, or natural bio-reduction. In sediments, TKN concentrations between 1000 mg/kg and 2000 mg/kg (dry weight) suggest moderate pollution, while levels greater than 2000 mg/kg indicate serious pollution.

The Lake St. Clair sample site with the highest sediment TKN concentration was Venter De Bueff Drain (n21) at 6,500 mg/kg. The lowest Lake St. Clair sediment TKN concentration was 240 mg/kg at Martin Drain (n6). In the watershed samples, the highest TKN concentration (1,800 mg/kg) occurred at Clinton River Spillway at the Wier (w43). The lowest TKN concentration (230 mg/kg) was found at Bear Creek at Old 13 Mile Rd. (w82) (Chart 18).

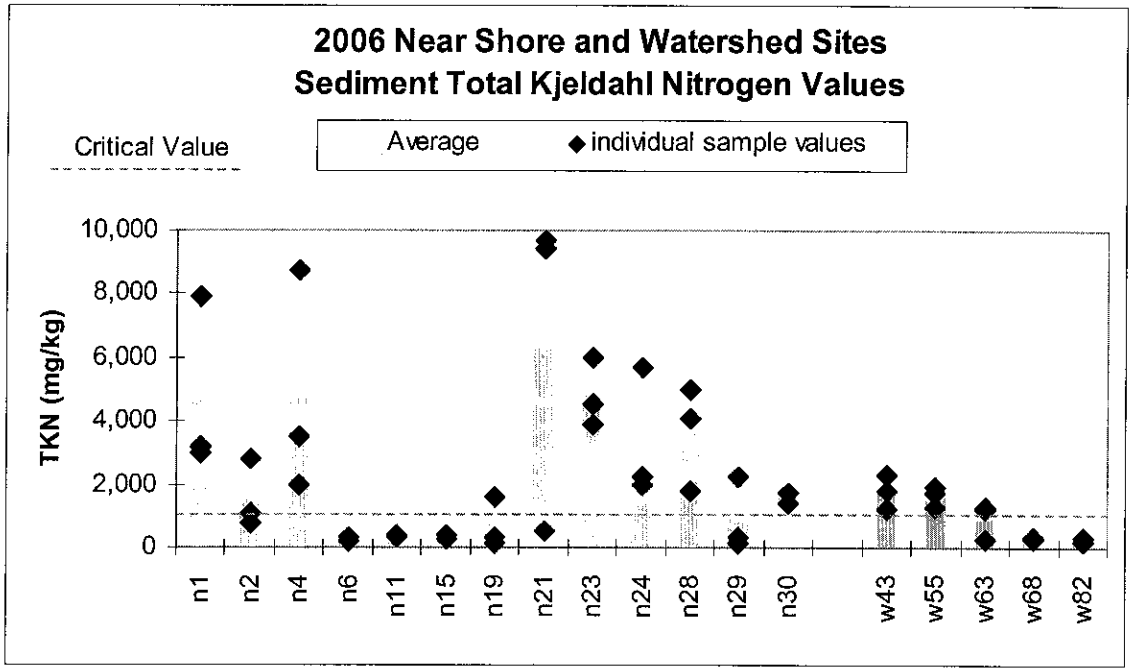


Chart 18: Spatial distribution of lake sediment and watershed sediment TKN

Ammonia

Ammonia (NH_3): Plant nutrient; source of nitrogen, which is needed to build protein. Ammonia in aquatic systems is derived from the natural breakdown of nitrogenous organic material, or as a result of industrial discharge. Aqueous concentrations above 0.2 mg/L may indicate pollution. In sediments, ammonia concentrations between 75 mg/kg and 200 mg/kg (dry weight) suggest moderate pollution, while levels greater than 200 mg/kg indicate serious pollution.

Average sediment values for Ammonia-Nitrogen exceeded the critical value of 75mg/kg at the Milk River (n1), Clinton River (n23), and Irwin Branch Relief Drain (n24) sample sites, as they did at these sites last year. The average sediment values for Ammonia-Nitrogen at the watershed sample sites were much lower, with Red Run at Utica Rd. (w55) having the highest watershed value at 16 mg/kg (Chart 19).

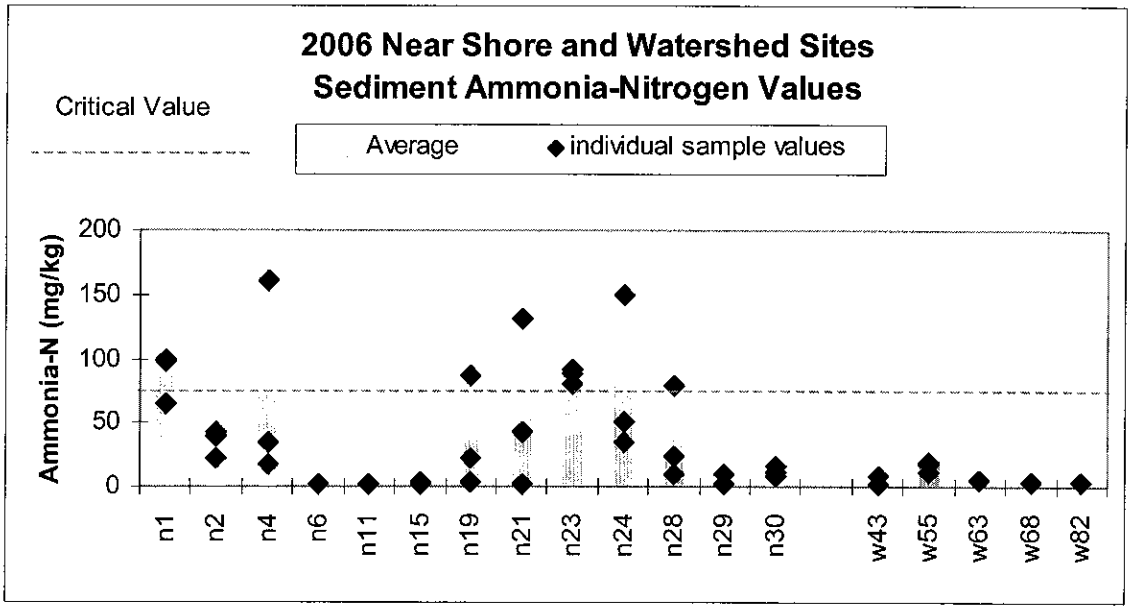


Chart 19: Spatial distribution of lake sediment and watershed sediment ammonia-nitrogen values.

Total Phosphorus

The highest average sediment Total Phosphorous concentration (1,100 mg/kg) was found at the Clinton River (n23). The lowest average sediment Total Phosphorous concentration (130 mg/kg) was found at the Clinton River Spillway (n19) (Chart 20).

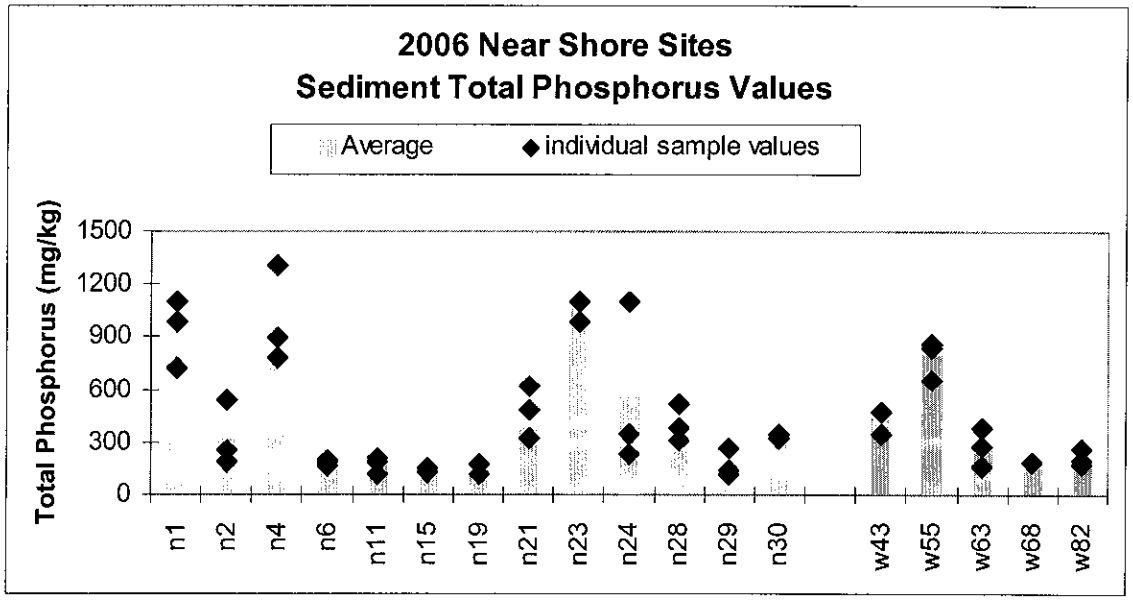


Chart 20: Spatial distribution of lake sediment and watershed sediment total phosphorus

Total Organic Carbon

The Lake St. Clair sample site with the highest sediment total organic carbon concentration was Venter De Bueff Drain (n21) at 50,000 mg/kg. This site had the lowest Lake St. Clair sediment TOC concentration last year at 1,900 mg/kg. In the watershed samples, the highest TOC concentration (18,000 mg/kg) occurred at Red Run at Utica Rd. (w55). The lowest TOC concentration (1,500 mg/kg) was found at Clinton River at Moravian (w68) (Chart 21).

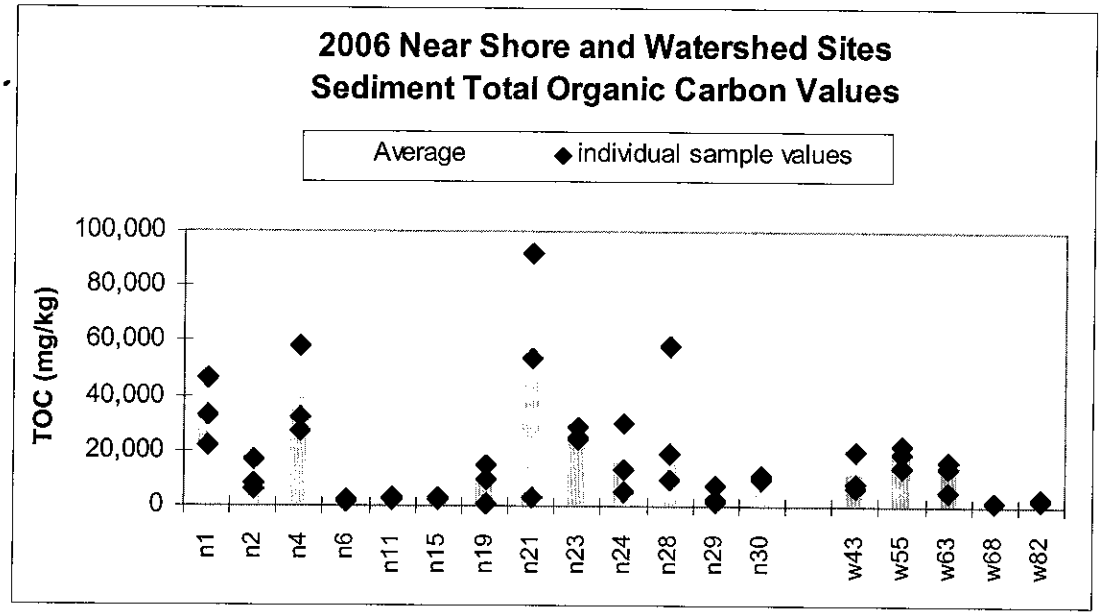


Chart 21: Spatial distribution of lake sediment and watershed sediment total organic carbon concentrations

Chemical Oxygen Demand

Chemical Oxygen Demand (COD): COD is a non-specific measure of the organic content and pollution strength of a sample. It is a measure of the amount of oxygen required to chemically oxidize the organic material in a sample. The test measures the total oxidizable carbon content, excluding aromatics, pyridines and alkyl compounds. In sediments, COD concentrations between 40,000 mg/kg and 80,000 mg/kg (dry weight) suggest moderate pollution, while levels greater than 80,000 mg/kg indicate serious pollution.

The Lake St. Clair sample site with the highest sediment chemical oxygen demand was Stephens Relief Drain (n4) at 140,000 mg/kg. The lowest Lake St. Clair sediment COD was 6,500 mg/kg at Martin Drain (n6). In the watershed samples, the highest COD (60,000 mg/kg) occurred at Red Run at Utica Rd. (w55). The lowest COD (6,600 mg/kg) was found at Clinton River at Moravian (w68) (Chart 22).

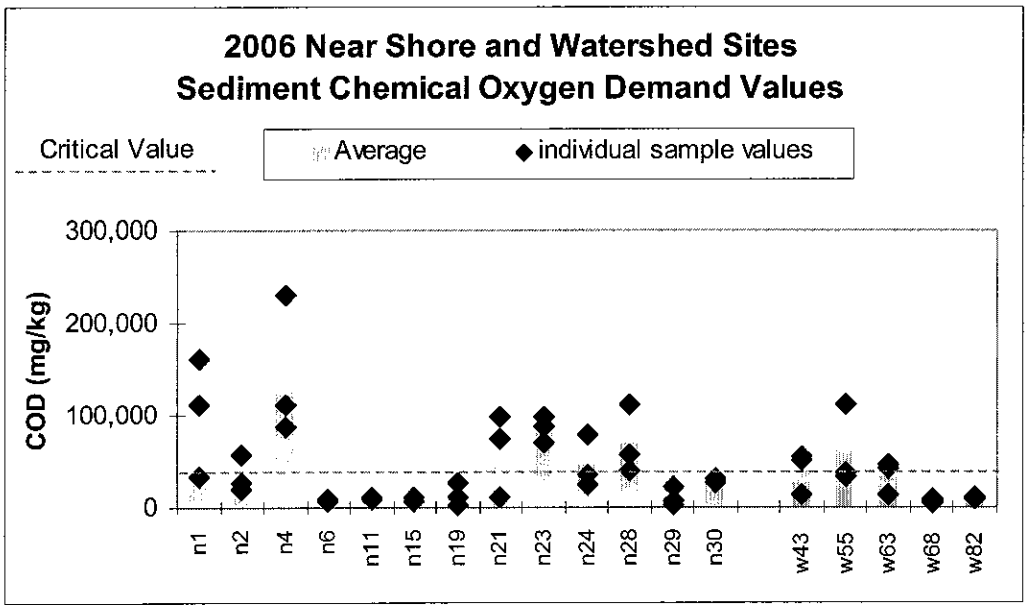


Chart 22: Spatial distribution of lake sediment and watershed sediment chemical oxygen demand

Metals

Metals: A wide variety of metals are found in aquatic sediments. Many metals are naturally occurring, but can also be derived from human activity. Low concentrations of many metals are necessary as nutrients for living organisms; however, higher concentrations in the environment may be toxic to aquatic organisms, especially benthic (bottom-dwelling) organisms. Metals are persistent pollutants and can bio-accumulate in some forms.

Sediment samples were collected in triplicate and average values from the results of metal analysis were compared to Ontario Ministry of Environment (OMOE) and United States Environmental Protection Agency (USEPA) sediment metal pollution classification guidelines (Table 1). All of the metals exceeded a guideline at least once in the near shore or watershed sample locations. Seven of the thirteen near shore sites sampled exceeded at least one of these guidelines. The Milk River (n1), Stephens Relief Drain (n4), and the Clinton River (n23) exceeded the greatest number of guidelines (Charts 23-31).

Three of the five watershed sites sampled exceeded at least one of these guidelines. Red Run at Utica Road (w55) exceeded the greatest number of guidelines. Sediment metal concentrations from the Clinton River at Heydenreich (w63) and Moravian (w68) did not exceed any guidelines (Chart 23).

	OMOE	OMOE	USEPA	USEPA
	Low Effect Level (mg/kg)	Severe Effect Level (mg/kg)	Moderately Polluted (mg/kg)	Heavily Polluted (mg/kg)
Arsenic	6.0	33.0	na	na
Cadmium	0.6	10	na	>6
Chromium	26.0	110	25-75	>75
Copper	16.0	110	25-50	>50
Lead	31.0	250.0	40-60	>60
Mercury	0.2	2	na	>1
Nickel	na	na	20-50	>50
Zinc	120	820	90-200	>200

Table 1: Ontario Ministry of Environment (OMOE) and United States Environmental Protection Agency (USEPA) Sediment Metal Pollution Classification Guidelines. Units are mg/kg dry weight of sediment.

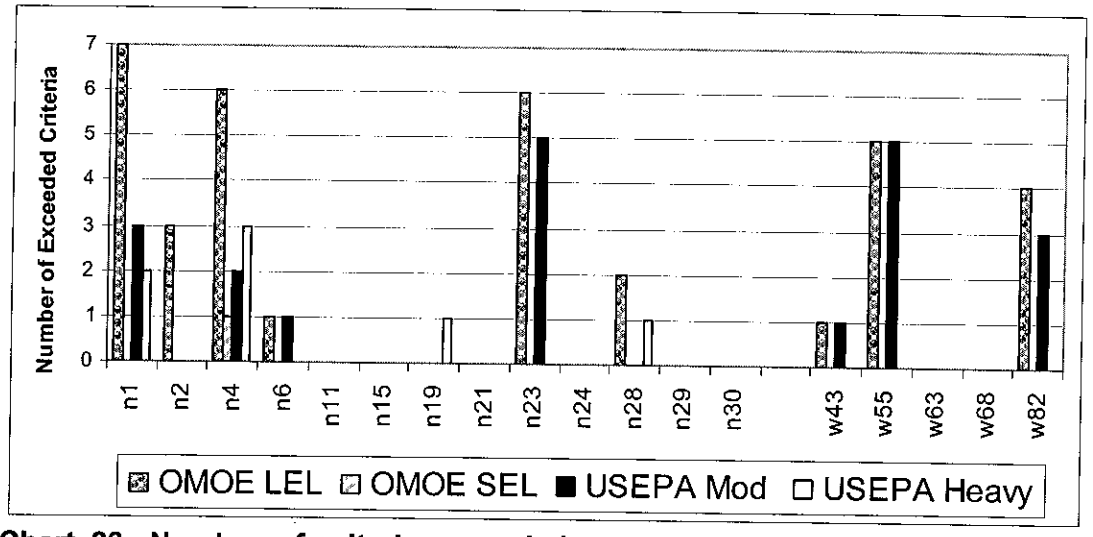


Chart 23: Number of criteria exceeded per site for near shore and watershed sample locations (average values of triplicate sampling)

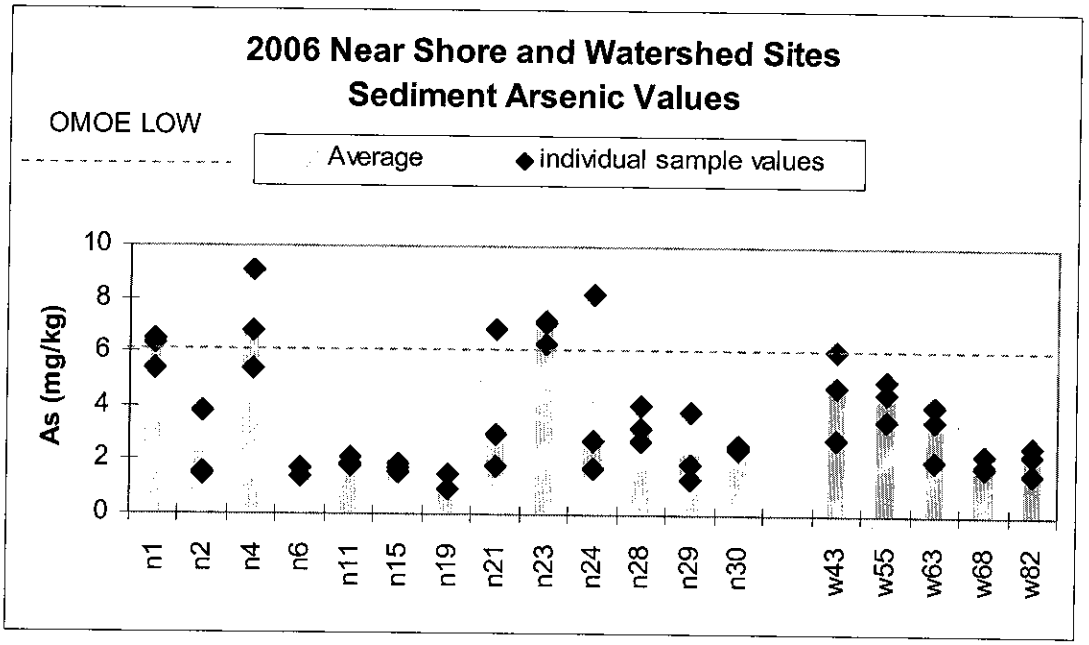


Chart 24: Near shore and watershed sediment arsenic

The highest average sediment arsenic level (7.1 mg/kg) was found at the Stephens Relief Drain (n4). The sediment arsenic concentrations at the Clinton River (6.9 mg/kg) and at the Milk River (6.1 mg/kg) also exceeded the OMOE low effect level. The lowest arsenic level (1.1 mg/kg) was found at site n19, the Clinton River Spillway.

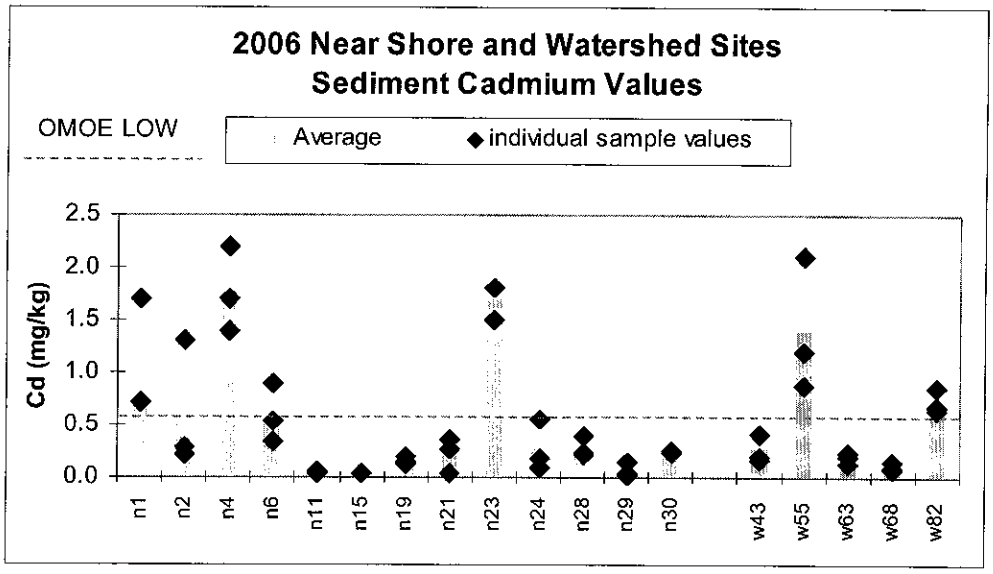


Chart 25: Near shore and watershed sediment cadmium

The highest Lake St. Clair sample site cadmium concentration (1.8 mg/kg) was found at Stephens Relief Drain (n4). The highest watershed cadmium concentration (1.4 mg/kg) was found in the Red Run at Utica Road (w55). The lowest Lake St. Clair sample site cadmium concentration (0.038 mg/kg) was found at Hetschler Drain (n15). The lowest watershed cadmium concentration (0.098 mg/kg) was found at the Clinton River at Moravian (w68).

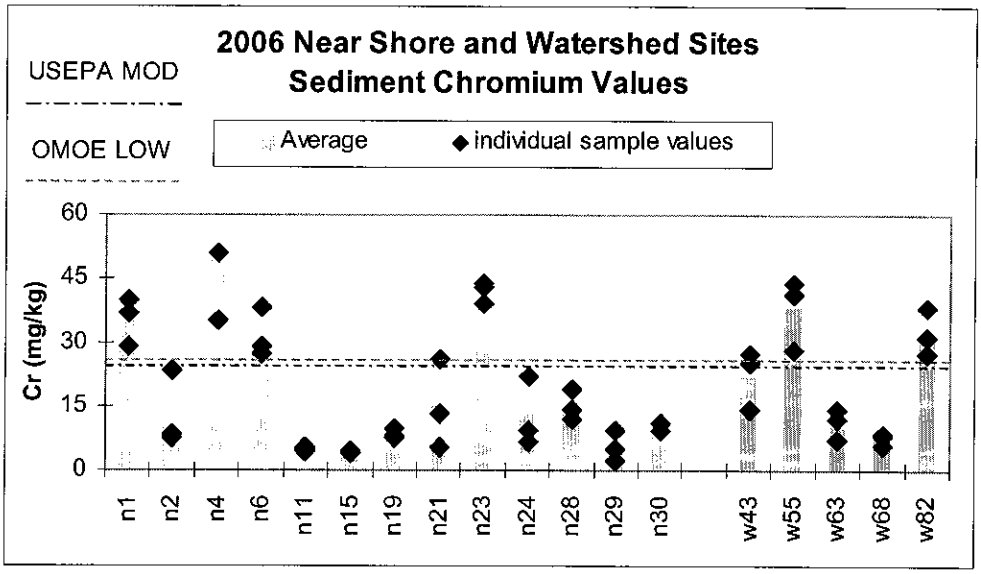


Chart 26: Near shore and watershed sediment chromium

The highest Lake St. Clair sample site sediment chromium concentration (49 mg/kg) was found at Stephens Relief Drain (n4). The highest watershed chromium concentration (38 mg/kg) was found in the Red Run at Utica Road (w55). The lowest Lake St. Clair sample site chromium concentration (4.1 mg/kg) was found at Hetschler Drain (n15). The lowest watershed chromium concentration (7.3 mg/kg) was found at the Clinton River at Moravian (w68). The correlation (R = 0.93) between highest and lowest sediment chromium and cadmium sites seems noteworthy.

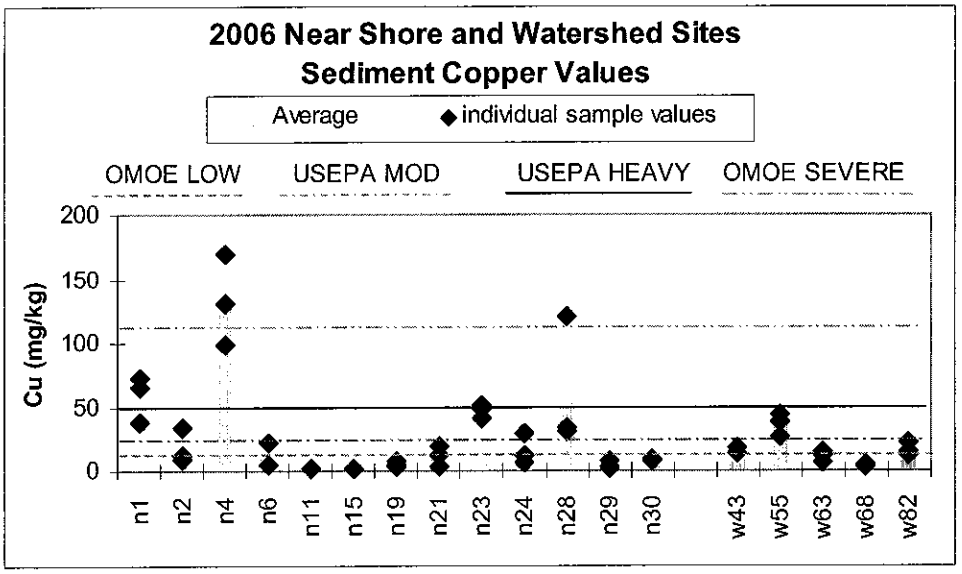


Chart 27: Near shore and watershed sediment copper

The highest Lake St. Clair sample site sediment copper concentration (130 mg/kg) was found at Stephens Relief Drain (n4). The highest watershed copper concentration (36 mg/kg) was found in the Red Run at Utica Road (w55). The lowest Lake St. Clair sediment sample site copper concentration (1.7 mg/kg) was found at Hetschler Drain (n15). The lowest watershed copper concentration (3.1 mg/kg) was found at the Clinton River at Moravian (w68).

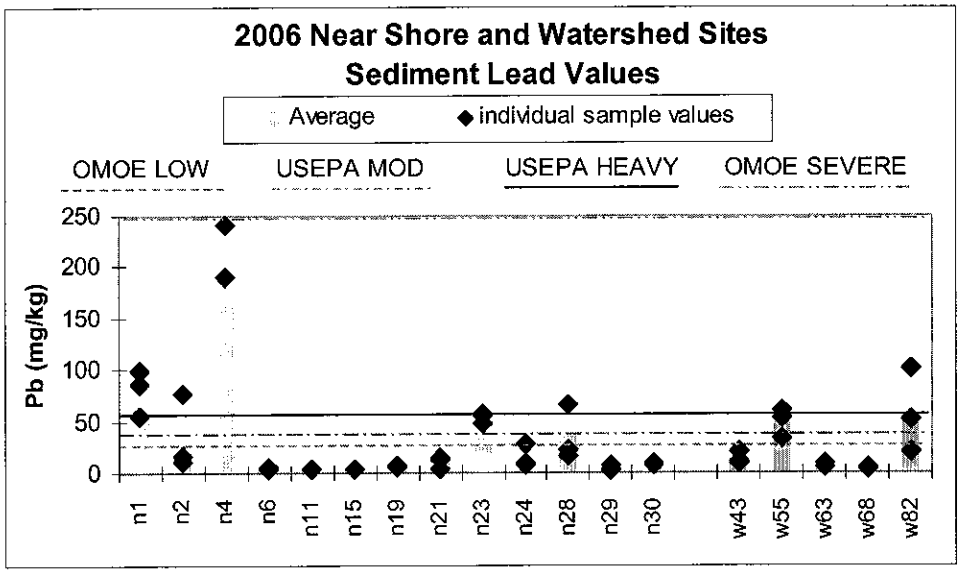


Chart 28: Near shore and watershed sediment lead

The highest Lake St. Clair sample site sediment lead concentration (190 mg/kg) was found at Stephens Relief Drain (n4). This sediment lead concentration was more than twice as high as the next highest sediment lead concentration (80 mg/kg) at Milk River (n1). The highest watershed lead concentration (57 mg/kg) was found at Bear Creek at Old 13 Mile Rd. (w82). The lowest Lake St. Clair sediment sample site lead concentration (3.1 mg/kg) was found at Hetschler Drain (n15). The lowest watershed lead concentration (3.8 mg/kg) was found at the Clinton River at Moravian (w68).

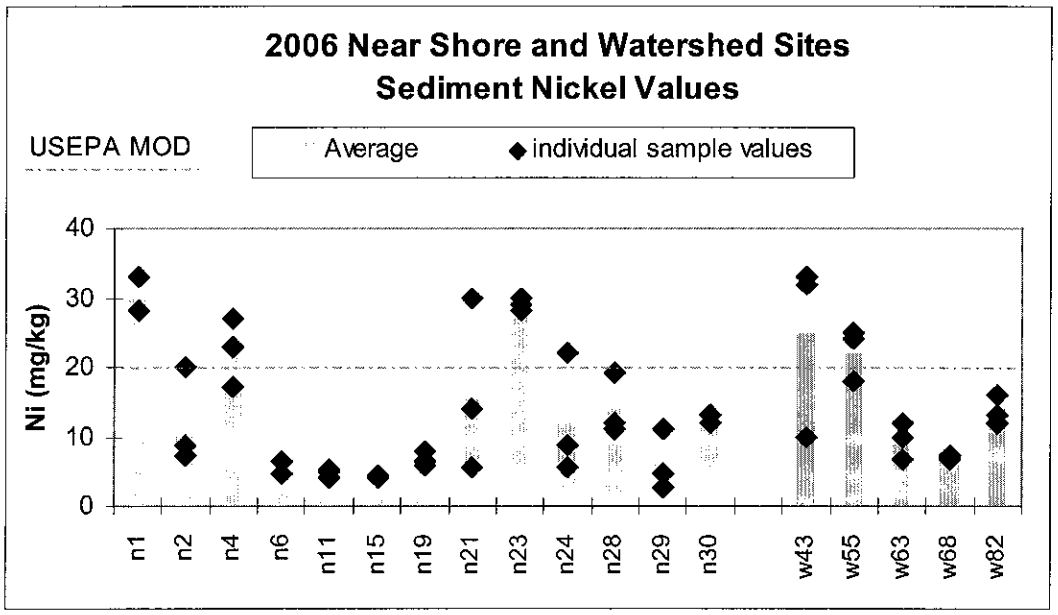


Chart 29: Near shore and watershed sediment nickel

The highest Lake St. Clair average sediment nickel concentration (30 mg/kg) was found in the sediment at the Milk River (n1). The highest watershed sample site nickel concentration (25 mg/kg) was found at the Clinton River Spillway at the weir (w43). The lowest average sediment nickel concentration (4.2 mg/kg) was recorded at Hetschler Drain (n15).

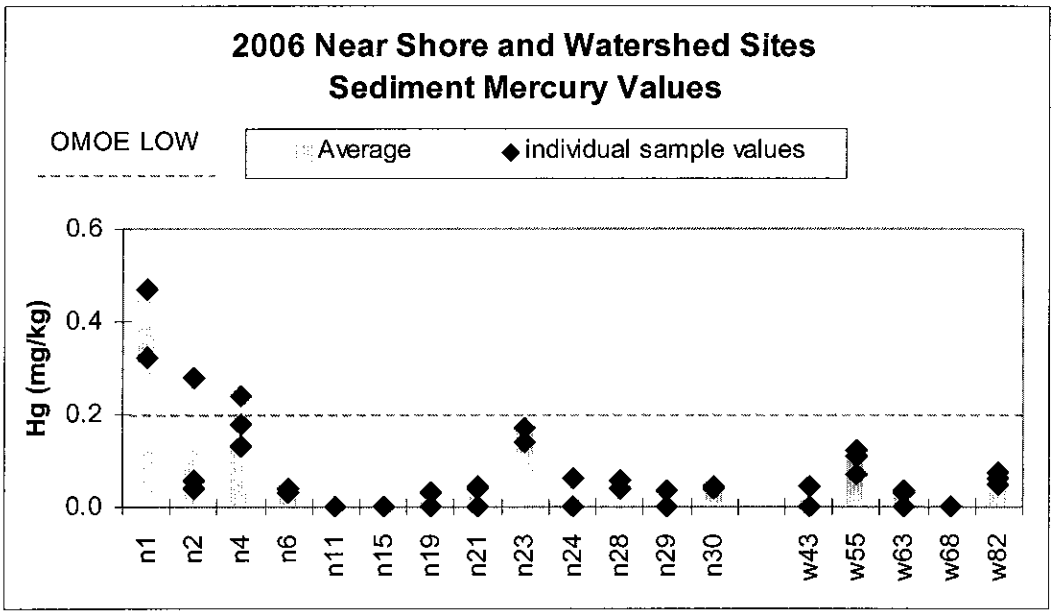


Chart 30: Near shore and watershed sediment mercury

The OMOE low effect level for sediment mercury was exceeded at the Milk River (n1) (0.47 mg/kg). This was the only site that exceeded the Ontario Ministry of the Environment's low effect level in 2006.

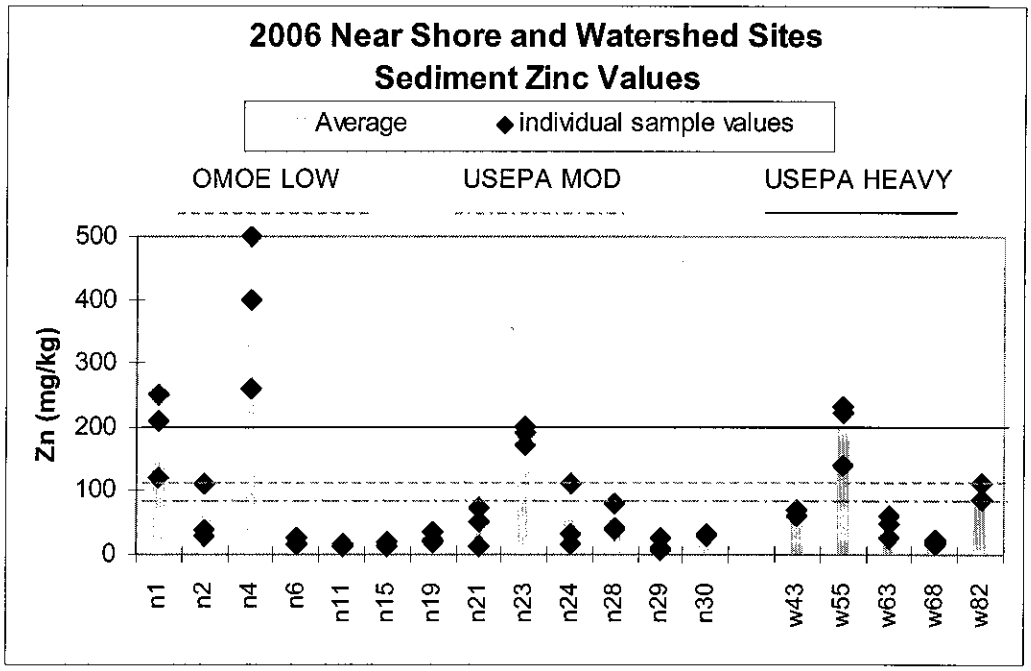


Chart 31: Near shore and watershed sediment zinc

Average sediment zinc concentrations exceeded the USEPA's heavily polluted level at Stephens Relief Drain (n4) (390 mg/kg) and Red Run at Utica Rd. (w55) (200 mg/kg). The lowest average sediment zinc level at a Lake St. Clair sample site (14 mg/kg) was recorded at Crapeau Creek (n29). The lowest watershed sediment zinc level (20 mg/kg) was found at the Clinton River at Moravian site (w68).

PCBs, PNAs, and Pesticides

PCB: Polychlorinated Biphenyls refers collectively to 209 compounds, which are composed of biphenyl rings in which one or more of the hydrogen atoms are replaced by a chlorine atom. PCBs were commonly used as electrical insulators and extreme pressure lubricants because they are stable, thermoplastic, and non-flammable. When released into the environment, PCBs are persistent and tend to bioaccumulate in the food chain. As a result of this, PCB use has been severely restricted. Many fish advisories in Michigan are due to PCBs.

PNA: Polynuclear Aromatic Hydrocarbons are a class of organic compounds with fused ring aromatic structures. PNAs result from incomplete combustion of organic carbon including wood, municipal solid waste, and fossil fuels, as well as, from natural or anthropogenic introduction of uncombusted coal and oil.

Pesticides: A substance intended for preventing, destroying, repelling or mitigating target pests. Pesticides monitored in this project are an environmental concern due to their persistence in the environment and known deleterious effects.

Results of PCB and PNA analysis were compared to Ontario Ministry of Environment (OMOE) and United States Environmental Protection Agency (USEPA) sediment classification guidelines (Table 2).

PCB's were detected in sediments at five of thirteen tested Lake St. Clair sample sites. At Milk River (n1), Liberty Drain (n2), Stephens Relief Drain (n4), Martin Drain (n6), and the Clinton River Spillway (n19), the average sediment PCB concentrations were 0.32, 0.64, and 0.36, 1.7, and 0.047 mg/kg respectively. All detected PCB concentrations exceeded the USEPA Threshold Effect Level of 0.032 mg/kg (Table 3). A PCB concentration of 0.063 mg/kg was found at Bear Creek at Old 13 Mile Rd (w82). This was the only detectable level of PCBs that was found in the sediment at any watershed site.

PNA residues were detected in the sediments at all tested sample sites except for Martin Drain (n6) and Hetschler Drain (n15). The highest PNA concentrations in the Lake St. Clair sample sites occurred at Milk River (n1) and Clinton River (n23), both 8.9 mg/kg. In the watershed, the highest sediment PNA concentrations (17 mg/kg) were found at the Clinton River at Heydenreich (w63).

Sediment pesticides residues were found in only two individual samples, both taken at watershed sites. 10 μg/kg 4,4'-DDT was found in a sediment sample taken from Red Run at Utica Rd. (w55), and 14 μg/kg 4,4'-DDT was found in a sediment sample taken from Bear Creek at Old 13 Mile Rd (w82).

	OMOE	OMOE	USEPA	USEPA
	Lowest Effect Level (mg/kg)	Severe Effect Level (mg/kg)	Threshold Effect Level (mg/kg)	Probable Effect Level (mg/kg)
Total PCB	0.07	5.3	0.032	0.24
Anthracene	0.22	3.7	0.01	0.17
Benz[a]anthracene	0.32	14.8	0.016	0.28
Benzo[a]pyrene	0.37	14.4	0.032	0.32
Chrysene	0.34	4.6	0.027	0.41
Phenanthrene	0.56	9.5	0.019	0.41
Total PNA	4	100	0.26	3.4

Table 2: Ontario Ministry of Environment (OMOE) and United States Environmental Protection Agency (USEPA) sediment PCB and PNA concentrations that have been observed or predicted to be associated with adverse effects on aquatic biota. Units are mg/kg dry weight of sediment.

	n1	n2	n4	n6	n11	n15	n19	n21	n23	n24	n28	n29	n30	w43	w55	w63	w68	w82
PCBs (ppm)																		
Aroclor-1016																		
Aroclor-1221																		
Aroclor-1232																		
Aroclor-1242				1.7														
Aroclor-1248																		
Aroclor-1254	0.32	0.64	0.36															
Aroclor-1260							0.047											0.063
Total PCB:	**0.32**	**0.64**	**0.36**	**1.7**			**0.047**											**0.063**
PNAs (ppm)																		
Naphthalene																		
2-Methylnaphthalene																		
Acenaphthylene																		
Acenaphthene																		
Fluorene																		
Phenanthrene		0.14	1.4				0.043								0.83	2.1	0.027	1.3
Anthracene																		
Fluoranthene	2.0	0.57	6.0				0.19	0.19	1.8		0.11			0.40	2.9	4.0	0.32	2.8
Pyrene	2.2	0.53	5.1				0.18		1.7		0.060			0.43	2.4	3.4	0.35	2.4
Benzo(a)anthracene	0.18	0.18	1.3						0.47		0.023				0.80	1.3	0.047	0.86
Chrysene	0.52	0.19	2.4				0.057		0.95						1.3	1.4	0.032	1.1
Benzo(b)fluoranthene	1.8	0.44	4.0				0.13	0.13	1.5		0.083	0.017		0.33	1.8	1.7	0.23	1.5
Benzo(k)fluoranthene	0.91	0.22	1.6		0.016		0.078	0.10					0.019	0.19	0.8	0.7733	0.14	0.65
Benzo(a)pyrene	0.99	0.22	2.0				0.067		0.77		0.021			0.18	1.0	1.2	0.11	0.85
Indeno(1,2,3-cd)pyrene	0.27	0.067	1.2				0.16	0.14	0.99	0.040	0.073	0.017			0.8	0.62	0.032	0.40
Dibenzo(a,h)anthracene																		
Benzo(g,h,i)perylene	0.13	0.053	1.1				0.053		0.83						0.7	0.53		0.30
Total PNA:	**8.9**	**2.6**	**26**		0.016		**0.96**	**0.47**	**8.9**	0.040	**0.37**	0.034	0.019	**1.5**	**13**	**17**	**1.3**	**12**

Table 3: Average near shore and watershed PCB and PNA results. Parameters with critical values and results that exceeded the critical values are in bold. Blank cells are those representing sites with no individual sample results above the reportable detection limit. Units are mg/kg dry weight of sediment.

Microbiology (Appendix H)

Escherichia coli (E. coli): A bacterium that is the predominant facultative anaerobe in the digestive tract of humans and warm-blooded animals. Used as an indicator of the presence of human or animal fecal matter in water.

Combined Sewer Overflow (CSO): A combined sewer is a sewer that is designed to carry both sanitary sewage and storm water to a wastewater treatment plant, where it receives complete treatment prior to discharge. A discharge from a combined sewer system occurs in response to rainfall and/or snowmelt when the carrying capacity of the sewer system is exceeded. Many CSO's receive partial treatment and/or chlorination prior to discharge.

Sanitary Sewer Overflow (SSO): SSOs are discharges of raw or inadequately treated sewage from a separated municipal sanitary sewer system. Most SSOs are associated with wet weather conditions when sanitary sewers receive inflow and infiltration from ground water.

Aqueous Microbiology

To relate the microbiological data to Bathing Beach Standards, geometric means are used to summarize *E. coli* levels. However, it is important to note that the sampling procedures for this project differ from those in the Total Body Contact Standard, and therefore, a direct comparison is not possible. The 30 day and daily Total Body Contact Standards are 130 and 300 *E. coli*/100 mL, respectively.

Lake St. Clair *E. coli*

The Lake St. Clair sample sites were ranked by the geometric mean of their *E. coli* concentrations over the entire sampling season (Chart 32). The annual geometric means did not exceed the 30 day Total Body Contact Standard at any Lake St. Clair site during 2006, nor did the geometric mean for all Lake St. Clair sites exceed this standard during any individual sampling event.

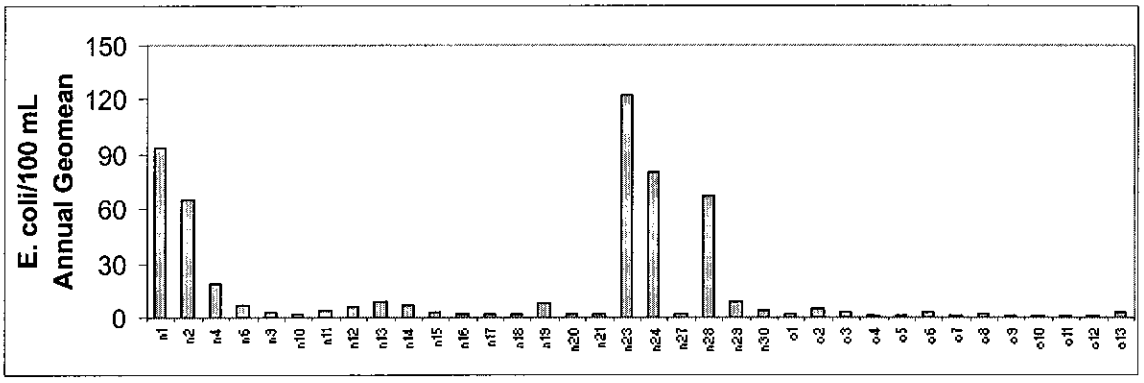


Chart 32: Geometric means of 2006 Lake St. Clair *E. coli* counts

For purposes of correlating *E. coli* counts with precipitation, the Lake St. Clair near shore sample sites were separated from the off shore sites because the near shore sites were sampled every week and the off shore samples were collected only three times over the course of the sampling season.

The geometric mean of all near shore sample site *E. coli* concentrations for each sampling date and precipitation in the 48 hours previous to each sampling date were plotted as a line graph together over time (Chart 33). A statistically significant correlation (r=0.91) between geomean near shore *E. coli* levels and 48 hour prior precipitation was established in this year's data set. (Chart 34).

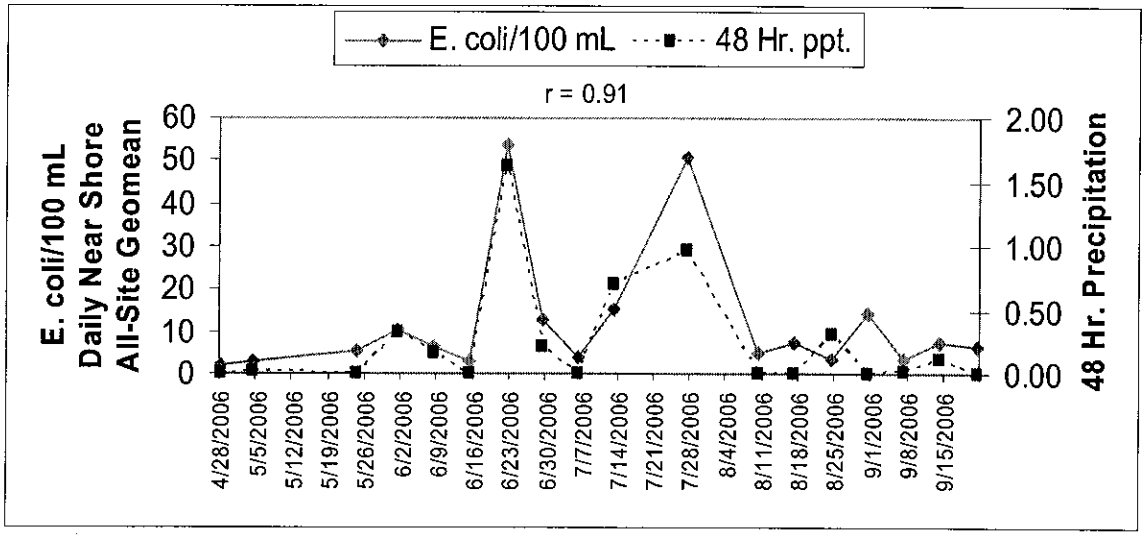


Chart 33: Geomean near shore *E. coli* levels and 48 hour precipitation.

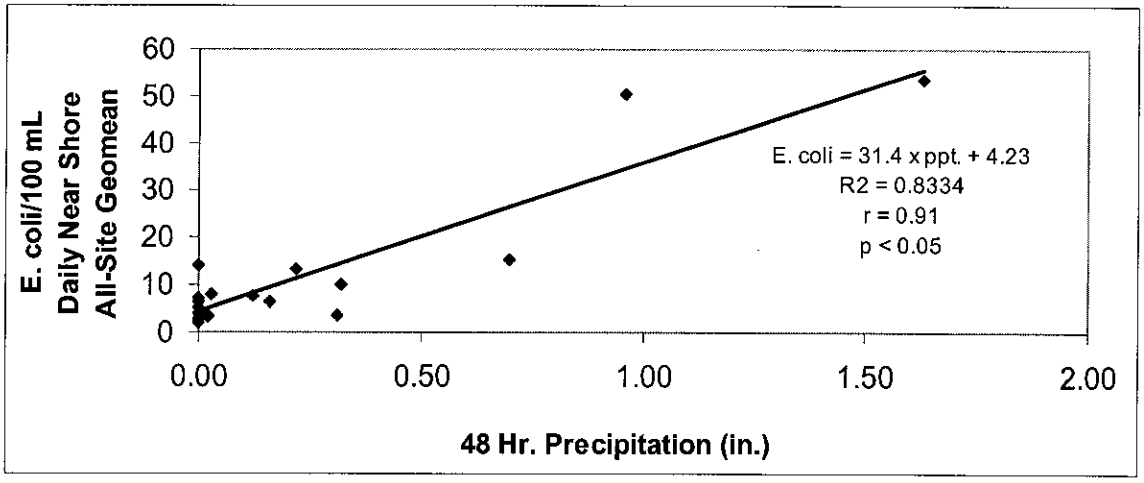


Chart 34: The relationship between E. coli levels and precipitation

Watershed *E. coli* Event Sampling (Appendix I)

The Clinton River Watershed was sampled during periods of rain at 21 strategic locations. The results were assessed in terms of their correlation to the amount of rainfall at SANGB the day of sampling, and can be found in Appendix I.

Sediment Microbiology

In the beach sampling, the only statistically significant correlation established between *E. coli* counts in water and in sediment and foreshore sand occurred at Blossom Heath beach. The Pearson correlation coefficient (r) between the *E. coli* counts in the foreshore sand and the *E. coli* counts in the water was 0.88 (Chart 35).

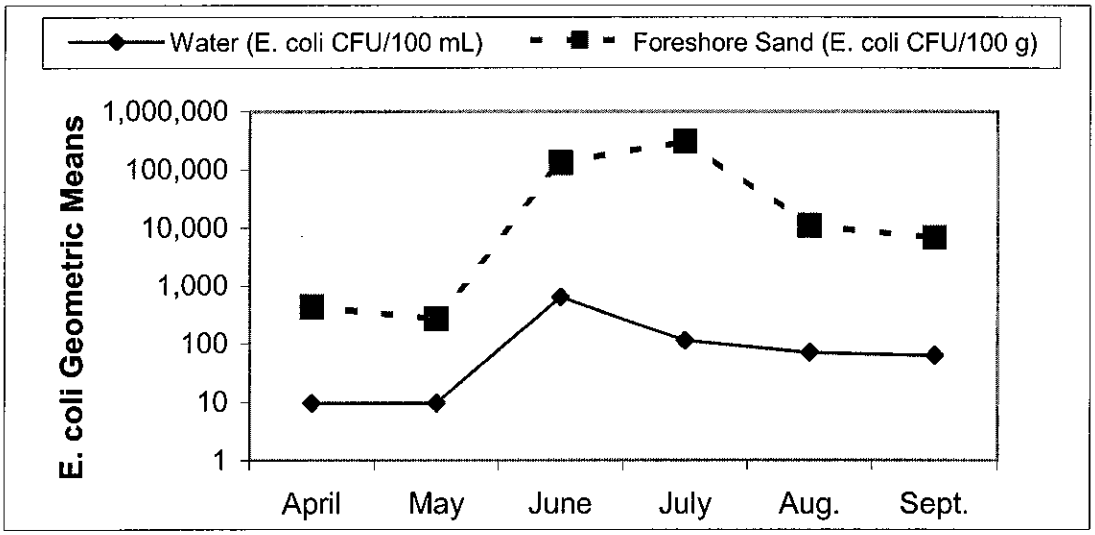


Chart 35: Foreshore sand and aqueous *E. coli* monthly geometric means at St. Clair Shores Blossom Heath Beach

No statistically significant correlation could be established between aqueous and sediment *E. coli* levels at either the watershed or the Lake St. Clair sample sites. The watershed and Lake St. Clair aqueous and sediment *E. coli* charts are displayed with a logarithmic y-axis because of the wide range of *E. coli* counts (Charts 36 and 37).

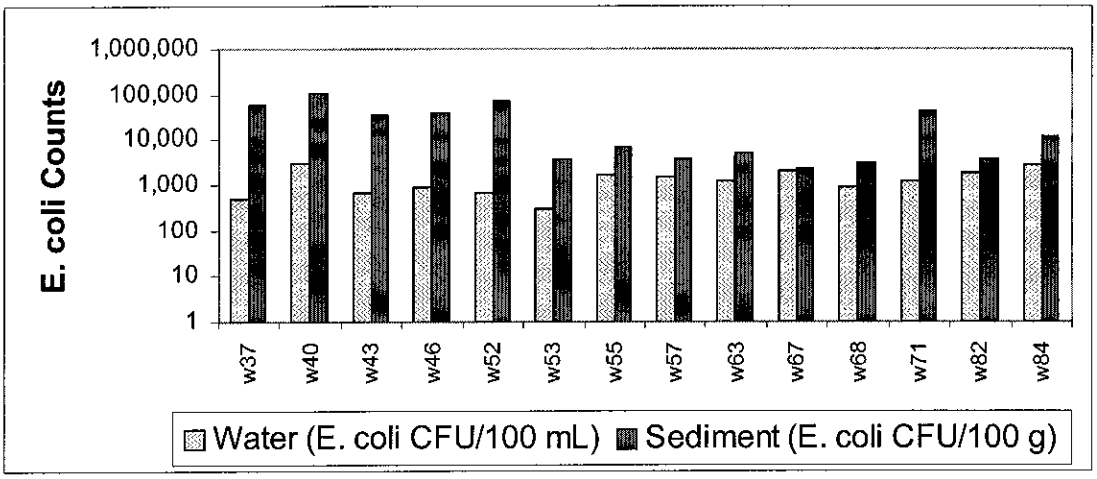


Chart 36: Sediment and aqueous *E. coli* concentrations at watershed locations

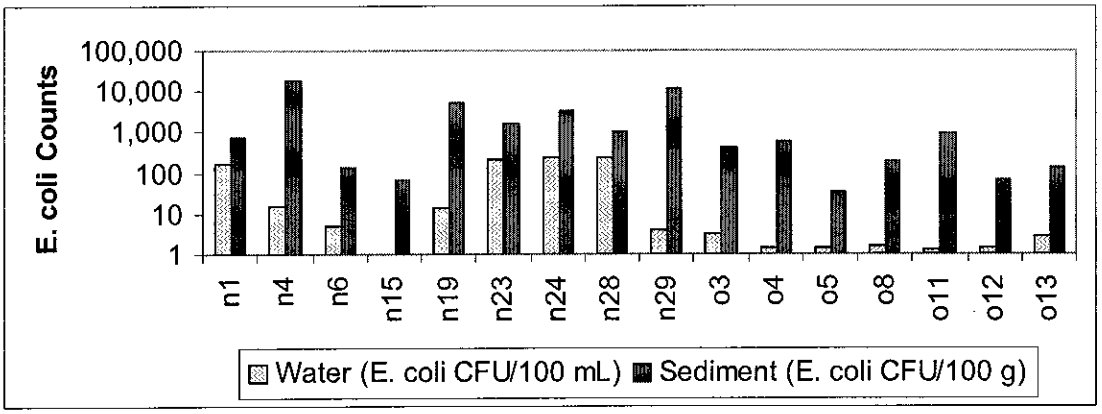


Chart 37: Sediment and aqueous *E. coli* concentrations at the Lake St. Clair sample sites

Basic Water Quality Parameters (Appendix H)

Conductivity: A measure of the ability of an aqueous solution to carry an electric current. This ability depends on the temperature of the measurement, and also on the concentration, mobility and valence of the ions. Solutions of most inorganic compounds are relatively good conductors. Conversely, molecules of organic compounds that do not dissociate in aqueous solution conduct a current very poorly, if at all.

Dissolved oxygen (DO): A direct measurement of the amount of oxygen in the system available to support aquatic life. Values above 7 mg/L are desirable, levels below 5 mg/L are considered problematic. Levels below 2 mg/L are lethal to many aquatic organisms.

pH: The negative logarithm of the hydrogen-ion concentration. Since an excessive concentration of hydrogen ions may adversely affect water for one or more beneficial uses, pH is a measure of a potential pollutant. It is also related to the concentration of many other substances because it controls the degree of disassociation of many substances. Most of the states that have established stream standards or effluent standards have limits for pH. Michigan regulations state that pH in streams must be maintained between "6.5 and 9.0" (R 323.1053 Michigan Administrative Code) unless the stream naturally exceeds these limitations.

Turbidity: Turbidity is a measurement of the extent to which light is diffracted and absorbed in a lake, measured in Nephelometric Turbidity Units (NTU). The level of suspended solids in the water column is directly related to turbidity. Suspended solids/turbidity may result from disturbing sediments or from surface water runoff. High levels of turbidity decrease the depth of light penetration, which may inhibit photosynthesis and productivity. Natural levels of turbidity and suspended solids vary among aquatic systems. Levels above 25 NTU may be objectionable.

Dissolved Oxygen

The highest average dissolved oxygen concentration (11.18 mg/L) was found at the Metropolitan Beach off shore site (o6). The lowest dissolved oxygen level (6.71 mg/L) was found at Irwin Branch Relief Drain (n24). This site had the only average dissolved oxygen level below the desired value of 7mg/L (Chart 38).

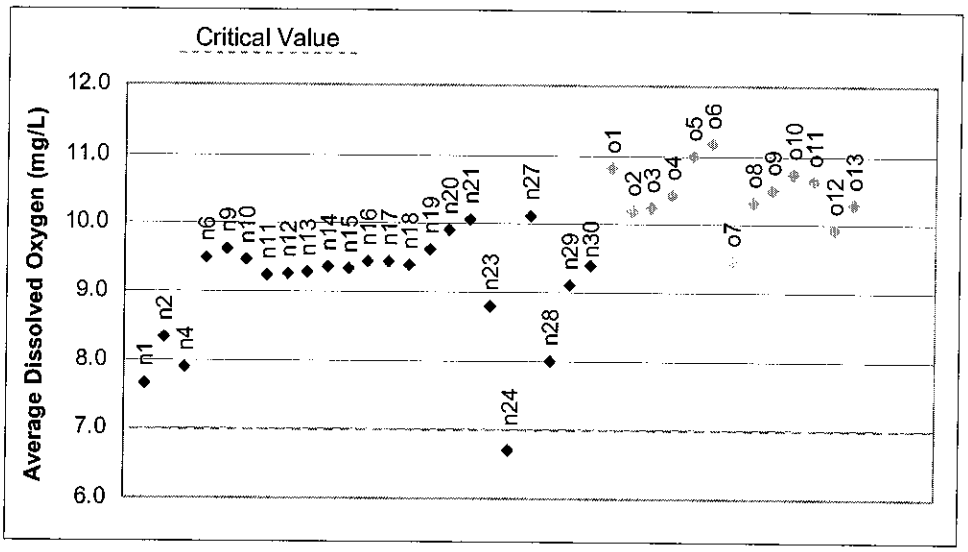


Chart 38: Spatial distribution of average dissolved oxygen levels

Turbidity

The only site with an average annual turbidity exceeding the critical value of 25 NTU was Salt River (n28) at 37 NTU. The lowest average annual turbidity (1 NTU) was recorded at Venter De Bueff Drain (n21) (Chart 39).

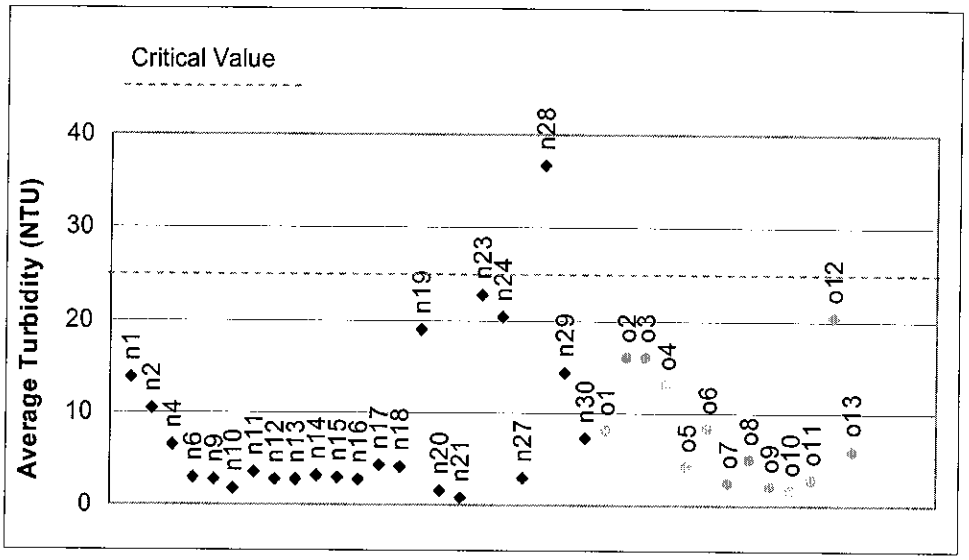


Chart 39: Spatial distribution of average turbidity values

pH

The highest average annual pH (8.56) was found at the Socia Crouchez Relief Drain (n14). The lowest average annual pH (7.47) was found at the Clinton River off shore site (o5) (Chart 40).

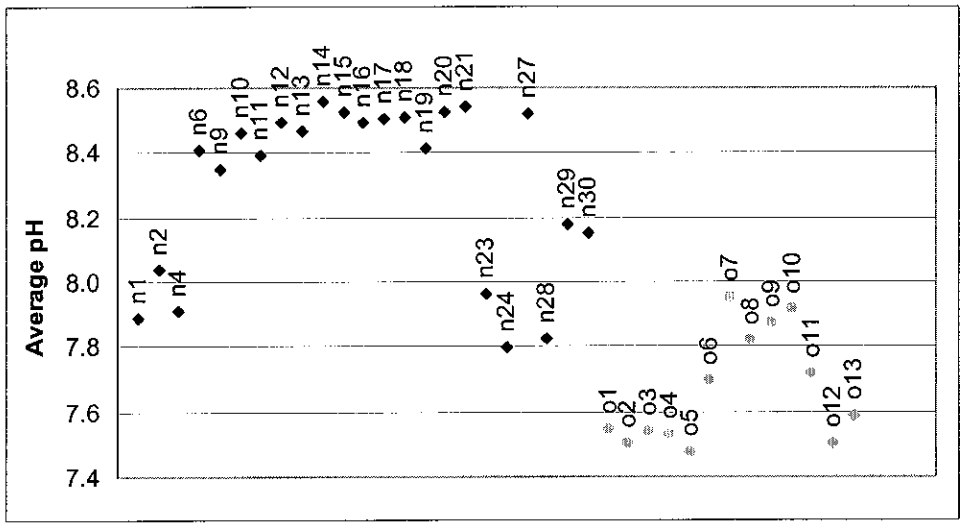


Chart 40: Spatial distribution of average pH values

Conductivity

The highest average annual conductivity reading (0.447 mS/cm) was obtained at the Clinton River (n23). The lowest reading (0.170 mS/cm) was found at the North Channel (o12) (Chart 41).

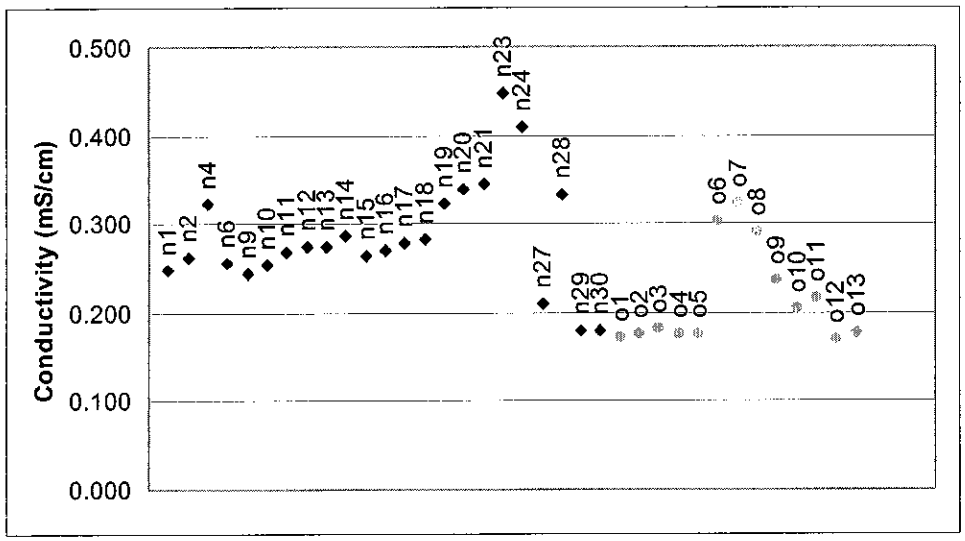


Chart 41: Spatial distribution of average conductivity values

Water Temperature

The highest average water temperature this sampling season (71.2 °F) was found at the Salt River off shore site (o3). The lowest average water temperature (65.0 °F) was found at the North Channel (o12) (Chart 42).

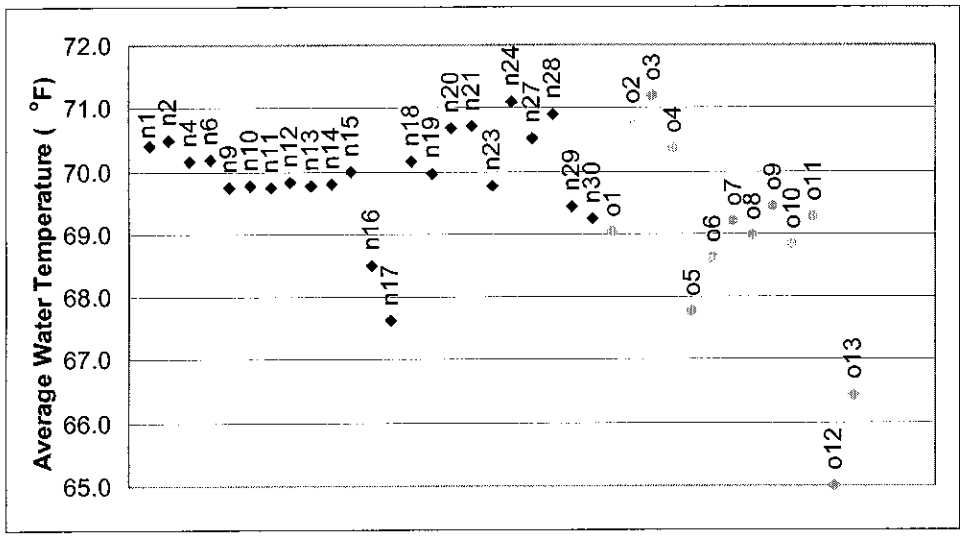


Chart 42: Spatial distribution of average water temperatures

DISCUSSION

2006 Observations

The aqueous and sediment results for near shore, off shore and watershed sample sites are summarized by site in Appendix F. In these site summaries the individual results have been transformed into z scores. The z score indicates how far and in what direction the result deviates from the average of all near shore, off shore or watershed sites, expressed in units of the distribution's standard deviation. This is a useful transformation to compare the relative standing of an individual result or site with the others.

Once again, site n23, the Clinton River, had the highest annual average nitrate level (1.3 mg/L) of any Lake St. Clair sample site. This is the eighth consecutive year this has happened. The 2006 n23 nitrate level is almost twice the average annual nitrate level for this site in 2005 (Chart 43). This site also had the highest annual average chloride level seven of the last eight years.

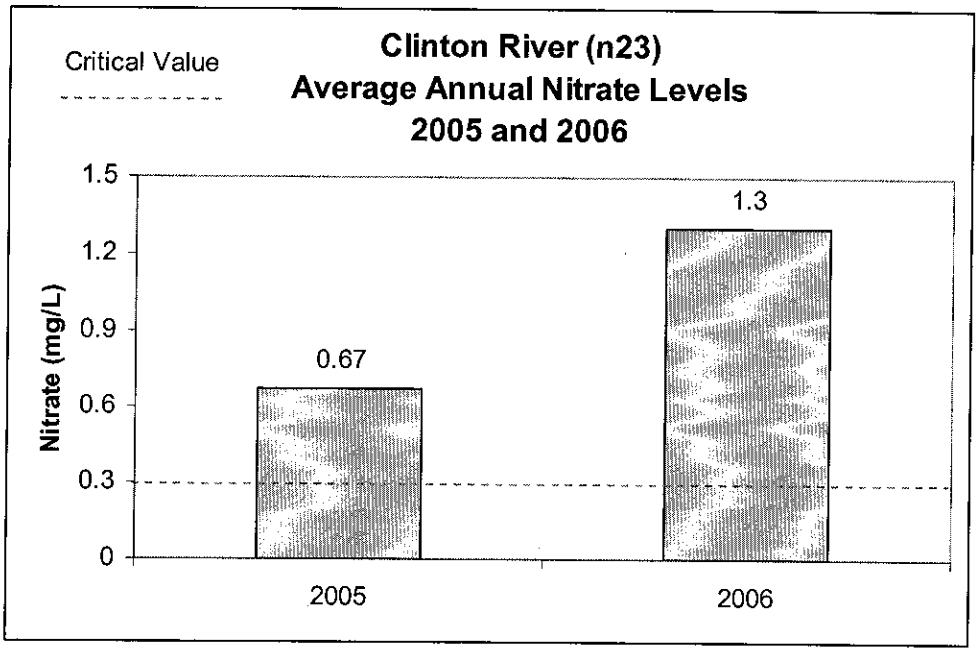


Chart 43: Average Annual nitrate level at the Clinton River (n23) 2005 and 2006

Seven sites (Martin Drain (n6), Lake Blvd. Drain (n11), Hetschler Relief Drain (n15), Crapeau Creek (n29), Marsac Drain (n30), and Clinton River Spillway at the Weir (w43)) had no average sediment metal values over any regulatory limit.

Sediment lead and PNA levels decreased dramatically at the Clinton River at Moravian (w68), when 2006 is compared to 2005 (Charts 44 and 45).

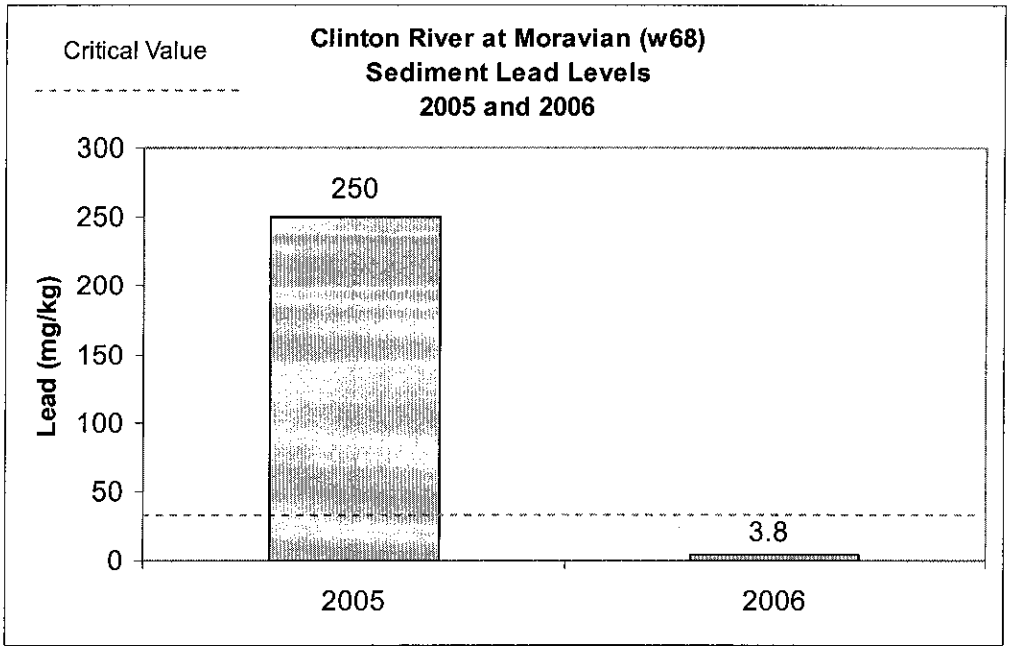


Chart 44: Lead levels at the Clinton River at Moravian (w68), 2005 and 2006

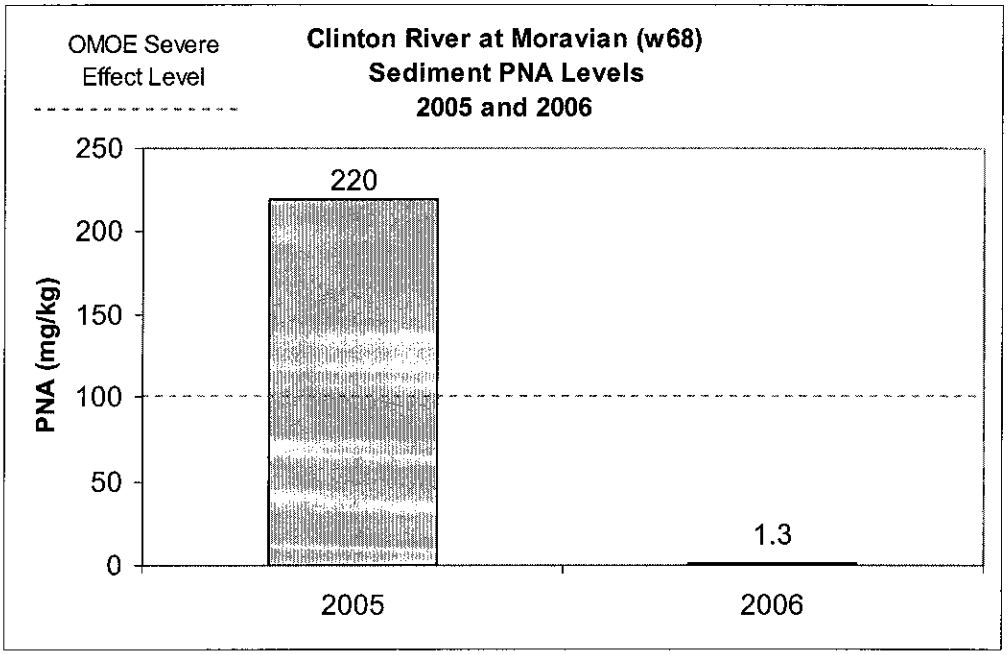


Chart 45: PNA levels at the Clinton River at Moravian (w68), 2005 and 2006

As in previous years, geometric means were used to summarize *E. coli* levels to relate the sample site microbiological data to bathing beach standards. None of the near shore or off shore sample site annual *E. coli* geometric means exceeded the 30 day Total Body Contact Standard. The site with the highest annual *E. coli* geometric mean (123 E. coli CFU/100 mL) was the Clinton River (n23).

HISTORICAL OBSERVATIONS

The Lake St. Clair Assessment Project began in 1998 and now includes nine years of comprehensive data on water and sediment quality in Lake St. Clair and the Clinton River Watershed. With nine years of data, trends and associations can be more clearly seen.

Aqueous Chemistry

RANKINGS:

The top ten average values (in mg/L) over the last nine years for the eight routinely measured aqueous chemistry parameters are presented in Tables 4 and 5.

	Nitrate Rankings			Total Phosphorous Rankings		
	Site	Location	NO_3	Site	Location	tP
1	n23	Clinton River	0.92	n19	Clinton River Spillway	0.11
2	n29	Crapeau Creek	0.39	n15	Hetschler Relief Drain	0.099
3	n19	Clinton River Spillway	0.38	n24	Irwin Branch Relief Drain	0.098
4	n28	Salt River	0.36	n23	Clinton River	0.094
5	o13	S. Channel	0.34	n2	Liberty Drain	0.085
6	o12	N. Channel	0.31	n28	Salt River	0.077
7	o6	Metropolitan Beach	0.30	n14	Socia Crouchez Relief Drain	0.077
8	o1	New Baltimore WTP Intake	0.23	n1	Milk River	0.058
9	o2	Crapeau Creek	0.23	o13	S. Channel	0.039
10	o5	Clinton River	0.22	o8	Clinton River Spillway	0.033

	o-Phosphate Rankings			Total Organic Carbon Rankings		
	Site	Location	oP	Site	Location	TOC
1	n23	Clinton River	0.037	n24	Irwin Branch Relief Drain	6.0
2	n28	Salt River	0.029	n23	Clinton River	5.6
3	n1	Milk River	0.026	n28	Salt River	5.6
4	n19	Clinton River Spillway	0.022	n19	Clinton River Spillway	4.6
5	n24	Irwin Branch Relief Drain	0.021	n2	Liberty Drain	4.0
6	n2	Liberty Drain	0.014	n21	Venter DeBueff Drain	4.0
7	n27	Dykeman Drain	0.011	n20	Murdock-Ballard Drain	4.0
8	n30	Marsac Drain	0.0087	o6	Metropolitan Beach	3.9
9	o7	Mt. Clemens WTP Intake	0.0085	n27	Dykeman Drain	3.8
10	o8	Clinton Spillway	0.0077	n1	Milk River	3.6

Table 4: Site rankings for nitrate, total phosphorous, orthophosphate, and total organic carbon

	Chloride Rankings			Total Kjeldahl Nitrogen Rankings		
	Site	Location	Cl	Site	Location	TKN
1	n23	Clinton River	89	o11	Milk River	1.2
2	n24	Irwin Branch Relief Drain	68	o10	Coast Guard Station	1.1
3	n19	Clinton River Spillway	55	o6	Metropolitan Beach	1.1
4	n20	Murdock-Ballard Drain	52	o9	Memorial- Hetschler	0.97
5	n21	Venter DeBueff Drain	52	o7	Mt. Clemens WTP Intake	0.94
6	n28	Salt River	52	o4	Irwin	0.84
7	o6	Metropolitan Beach	47	o2	Crapeau Creek	0.80
8	o8	Clinton Spillway	41	o8	Clinton Spillway	0.78
9	n4	Stephens Relief Drain	40	n24	Irwin Branch Relief Drain	0.74
10	o7	Mt. Clemens WTP Intake	40	n2	Liberty Drain	0.70

	Ammonia Rankings			Biochemical Oxygen Demand Rankings		
	Site	Location	NH3	Site	Location	BOD
1	n1	Milk River	0.111	n2	Liberty Drain	1.6
2	n24	Irwin Branch Relief Drain	0.108	n23	Clinton River	1.4
3	n28	Salt River	0.102	n24	Irwin Branch Relief Drain	1.1
4	n23	Clinton River	0.079	o13	S. Channel	0.96
5	n4	Stephens Relief Drain	0.078	n19	Clinton River Spillway	0.93
6	n2	Liberty Drain	0.077	n28	Salt River	0.90
7	n29	Crapeau Creek	0.071	n1	Milk River	0.73
8	o2	Crapeau Creek	0.059	n14	Socia Crouchez Relief Drain	0.67
9	n19	Clinton River Spillway	0.054	o3	Salt River	0.64
10	n6	Martin Drain	0.053	n16	Mulso- Lipke Relief Drain	0.58

Table 5: Site rankings for chloride, total Kjeldahl nitrogen, ammonia, and biochemical oxygen demand

Two important points should be noted about these aqueous chemistry rankings.

First, there is no statistically significant correlation between the site rankings for nitrate and total phosphorous values. There is, however, a statistically significant relationship between nitrate and total phosphate levels at the Clinton River (n23) (Chart 46).

Second, the eight sites with the highest Total Kjeldahl Nitrogen values are all off shore sites. The cause of this is unexplained.

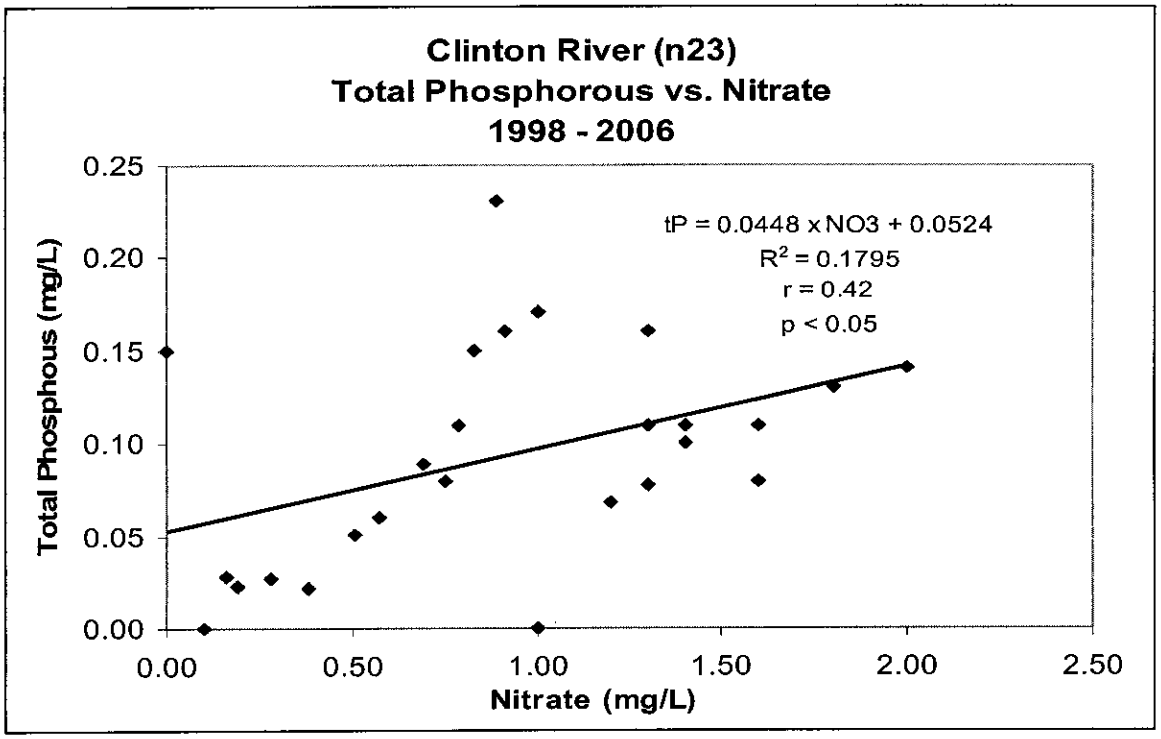


Chart 46: The relationship between total phosphorous and nitrate at the Clinton River (n23) 1998 – 2006

Statistically significant seasonal differences in the Lake St. Clair all-site averages have been found for all aqueous chemistry parameters except ortho-phosphate (Table 6).

Aqueous Chemistry 1998 - 2006 Lake St. Clair All-Site Averages (mg/L) Statistically Significant Seasonal Differences					
Analyte	Spring	Summer	Fall	Significant Difference	
Nitrate	0.39	0.11	0.13	YES	Spring higher than summer or fall.
Total Kjeldahl Nitrogen	0.27	0.30	0.92	YES	Fall higher than spring or summer.
Ammonia-N	0.056	0.031	0.044	YES	Spring higher than summer or fall. Fall higher than summer.
ortho-Phosphate	0.0094	0.0075	0.0053	NO	No statistically significant seasonal differences.
Total Phosphorous	0.049	0.020	0.026	YES	Spring higher than summer. Fall higher than summer.
Total Organic Carbon	2.7	3.0	3.1	YES	Spring lower than summer or fall.
Biochemical Oxygen Demand	0.89	0.25	0.39	YES	Spring higher than summer or fall.
Chloride	29	29	31	YES	Fall higher than spring or summer.

Table 6: Seasonal differences in Lake St. Clair aqueous chemistry all-site averages

Eleven individual Lake St. Clair sample sites were selected for seasonal comparisons. Despite the fact that the Lake St. Clair all-site average for total phosphorous shows seasonal differences, none of the eleven selected sites demonstrated any statistically significant difference for total phosphorous or ortho-phosphate (Tables 7 and 8).

Total Phosphorous Averages (mg/L) 1998 - 2006 Seasonal Comparisons					
Site	Spring	Summer	Fall	Significant Difference	
n1 - Milk River	0.056	0.067	0.051	NO	No statistically significant seasonal differences.
n2 - Liberty Drain	0.096	0.059	0.10	NO	No statistically significant seasonal differences.
n4 - Stephens Relief Drain	0.020	0.022	0.034	NO	No statistically significant seasonal differences.
n6 - Martin Drain	0.028	0.014	0.021	NO	No statistically significant seasonal differences.
n23 - Clinton River	0.11	0.078	0.094	NO	No statistically significant seasonal differences.
n24 - Irwin Branch Relief Drain	0.13	0.078	0.091	NO	No statistically significant seasonal differences.
n28 - Salt River	0.079	0.076	0.076	NO	No statistically significant seasonal differences.
o3 - Salt River (off shore site)	0.028	0.011	0.024	NO	No statistically significant seasonal differences.
o6 - Metropolitan Beach	0.056	0.011	0.0081	NO	No statistically significant seasonal differences.
o12 - North Channel	0.068	0.000	0.0074	NO	No statistically significant seasonal differences.
o13 - South Channel	0.11	0.000	0.0050	NO	No statistically significant seasonal differences.

Table 7: Seasonal differences in selected Lake St. Clair sample site total phosphorous averages

ortho-Phosphate Averages (mg/L) 1998 - 2006 Seasonal Comparisons					
Site	Spring	Summer	Fall	Significant Difference	
n1 - Milk River	0.019	0.044	0.013	NO	No statistically significant seasonal differences.
n2 - Liberty Drain	0.018	0.015	0.0074	NO	No statistically significant seasonal differences.
n4 - Stephens Relief Drain	0.0034	0.0017	0.0042	NO	No statistically significant seasonal differences.
n6 - Martin Drain	0.0069	0.000	0.000	NO	No statistically significant seasonal differences.
n23 - Clinton River	0.044	0.029	0.040	NO	No statistically significant seasonal differences.
n24 - Irwin Branch Relief Drain	0.027	0.020	0.017	NO	No statistically significant seasonal differences.
n28 - Salt River	0.039	0.025	0.024	NO	No statistically significant seasonal differences.
o3 - Salt River (off shore site)	0.0039	0.0053	0.0079	NO	No statistically significant seasonal differences.
o6 - Metropolitan Beach	0.0059	0.0076	0.000	NO	No statistically significant seasonal differences.
o12 - North Channel	0.000	0.021	0.000	NO	No statistically significant seasonal differences.
o13 - South Channel	0.0060	0.013	0.000	NO	No statistically significant seasonal differences.

Table 8: Seasonal differences in selected Lake St. Clair sample site ortho-phosphate averages

No statically significant seasonal differences in total organic carbon were noted at any off shore sample site, nor at the Milk River (n1) or at Irwin Branch Relief Drain (n24) (Table 9).

Total Organic Carbon Averages (mg/L) 1998 - 2006 Seasonal Comparisons					
Site	Spring	Summer	Fall	Significant Difference	
n1 - Milk River	3.4	3.6	3.9	NO	No statistically significant seasonal differences.
n2 - Liberty Drain	3.4	4.1	4.6	YES	Fall higher than spring.
n4 - Stephens Relief Drain	2.8	3.6	4.1	YES	Spring lower than summer or fall.
n6 - Martin Drain	2.6	3.4	3.6	YES	Spring lower than summer or fall.
n23 - Clinton River	6.9	5.1	5.0	YES	Spring higher than summer or fall.
n24 - Irwin Branch Relief Drain	5.4	6.3	6.3	NO	No statistically significant seasonal differences.
n28 - Salt River	7.6	4.8	4.7	YES	Spring higher than summer or fall.
o3 - Salt River (off shore site)	2.7	3.1	2.9	NO	No statistically significant seasonal differences.
o6 - Metropolitan Beach	3.5	4.5	3.6	NO	No statistically significant seasonal differences.
o12 - North Channel	1.7	1.6	2.2	NO	No statistically significant seasonal differences.
o13 - South Channel	1.3	1.7	2.2	NO	No statistically significant seasonal differences.

Table 9: Seasonal differences in selected Lake St. Clair sample site total organic carbon averages

The individual site seasonal comparison pattern for chloride was quite similar to that for total organic carbon, with the major difference being higher chloride concentrations in the fall at the Milk River (n1), Stephens Relief Drain (n4), and Martin Drain (n6) (Table 10).

Chloride Averages (mg/L) 1998 - 2006 Seasonal Comparisons					
Site	Spring	Summer	Fall	Significant Difference	
n1 - Milk River	22	18	32	YES	Fall higher than spring or summer.
n2 - Liberty Drain	25	20	34	YES	Fall higher than summer.
n4 - Stephens Relief Drain	43	31	48	YES	Fall higher than summer.
n6 - Martin Drain	17	18	27	YES	Fall higher than spring.
n23 - Clinton River	121	97	63	YES	Spring higher than fall.
n24 - Irwin Branch Relief Drain	60	91	61	NO	No statistically significant seasonal differences.
n28 - Salt River	79	39	40	YES	Spring higher than summer or fall.
o3 - Salt River (off shore site)	15	11	10	NO	No statistically significant seasonal differences.
o6 - Metropolitan Beach	44	57	39	NO	No statistically significant seasonal differences.
o12 - North Channel	3.7	3.9	5.9	NO	No statistically significant seasonal differences.
o13 - South Channel	3.8	3.9	5.8	NO	No statistically significant seasonal differences.

Table 10: Seasonal differences in selected Lake St. Clair sample site chloride averages

At most Lake St. Clair sampling sites, the spring nitrate averages were significantly higher than those for the other two seasons. Important exceptions to this general rule occurred at the Clinton River (n23), and the South Channel (o13), where no statistically significant seasonal differences were noted (Table 11).

Nitrate Averages (mg/L) 1998 - 2006 Seasonal Comparisons					
Site	Spring	Summer	Fall	Significant Difference	
n1 - Milk River	0.33	0.080	0.042	YES	Spring higher than summer or fall.
n2 - Liberty Drain	0.30	0.074	0.023	YES	Spring higher than summer or fall.
n4 - Stephens Relief Drain	0.36	0.068	0.14	YES	Spring higher than summer or fall.
n6 - Martin Drain	0.35	0.022	0.00	YES	Spring higher than summer or fall.
n23 - Clinton River	1.1	0.88	0.84	NO	No statistically significant seasonal differences.
n24 - Irwin Branch Relief Drain	0.33	0.020	0.040	YES	Spring higher than summer or fall.
n28 - Salt River	0.73	0.14	0.24	YES	Spring higher than summer or fall.
o3 - Salt River (off shore site)	0.27	0.070	0.26	YES	Summer lower than spring or fall.
o6 - Metropolitan Beach	0.49	0.21	0.21	YES	Spring higher than summer or fall.
o12 - North Channel	0.35	0.31	0.27	YES	Spring higher than fall.
o13 - South Channel	0.39	0.32	0.31	NO	No statistically significant seasonal differences.

Table 11: Seasonal differences in selected Lake St. Clair sample site nitrate averages

Statistically significant decreasing trends in aqueous mercury levels have been noted at both the Clinton River (n23) and Milk River (w58) (Charts 47 and 48).

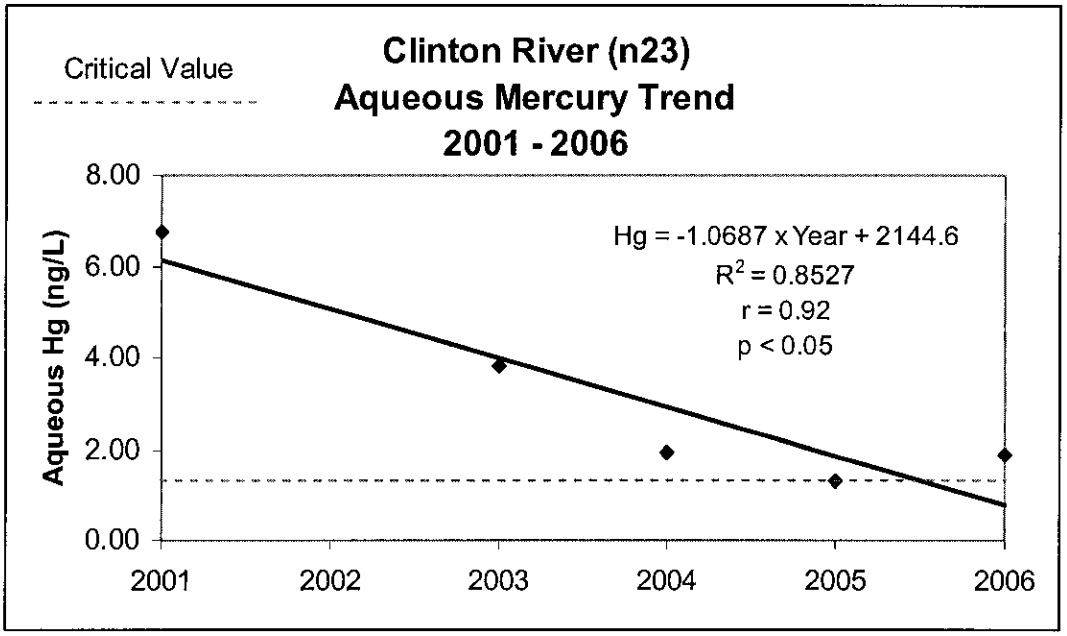


Chart 47: Aqueous mercury trend at the Clinton River (n23) 2001 – 2006

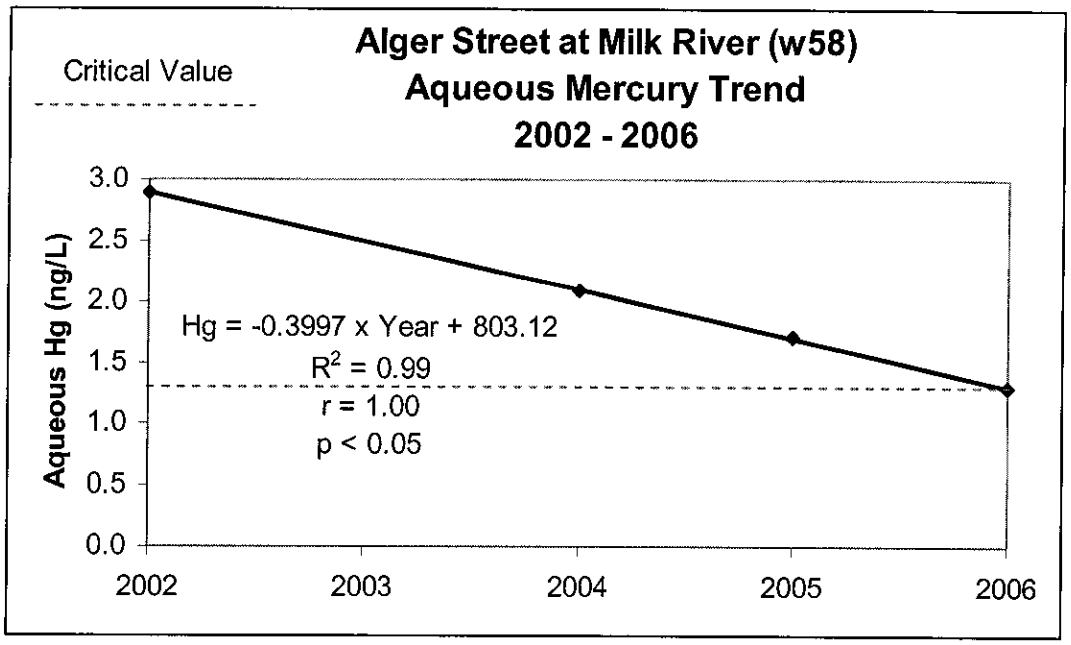


Chart 48: Aqueous mercury trend at the Milk River (w58) 2002 – 2006

Sediment Chemistry

The statistically significant decreases in sediment metals continued at Martin Drain (n6) in 2006 (Chart 49).

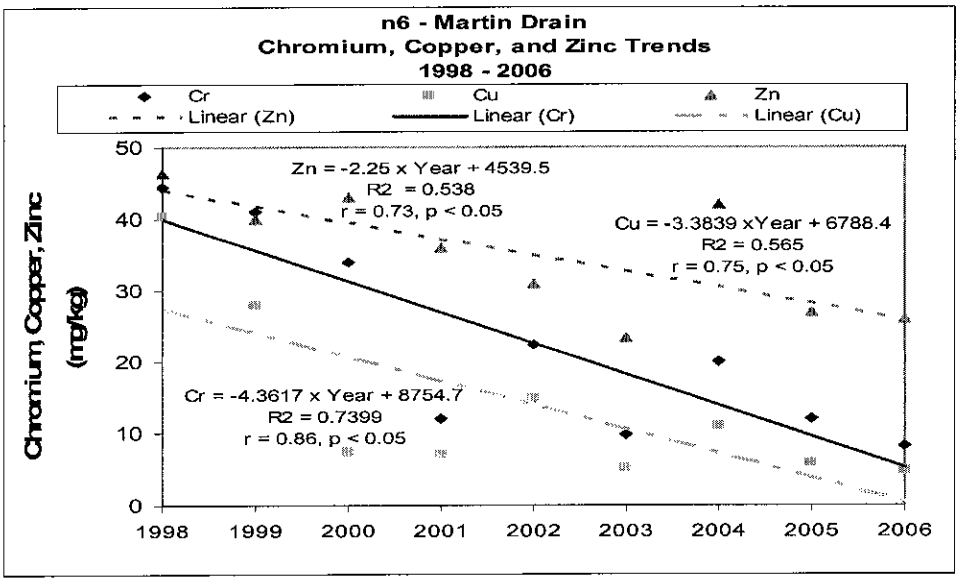


Chart 49: Martin Drain (n6) sediment metal trends 1998 – 2006

Lead and nickel levels continued to rise in the sediments at the Salt River (n28). The rate of increase of the lead concentration overtook that of the nickel concentration (Chart 50).

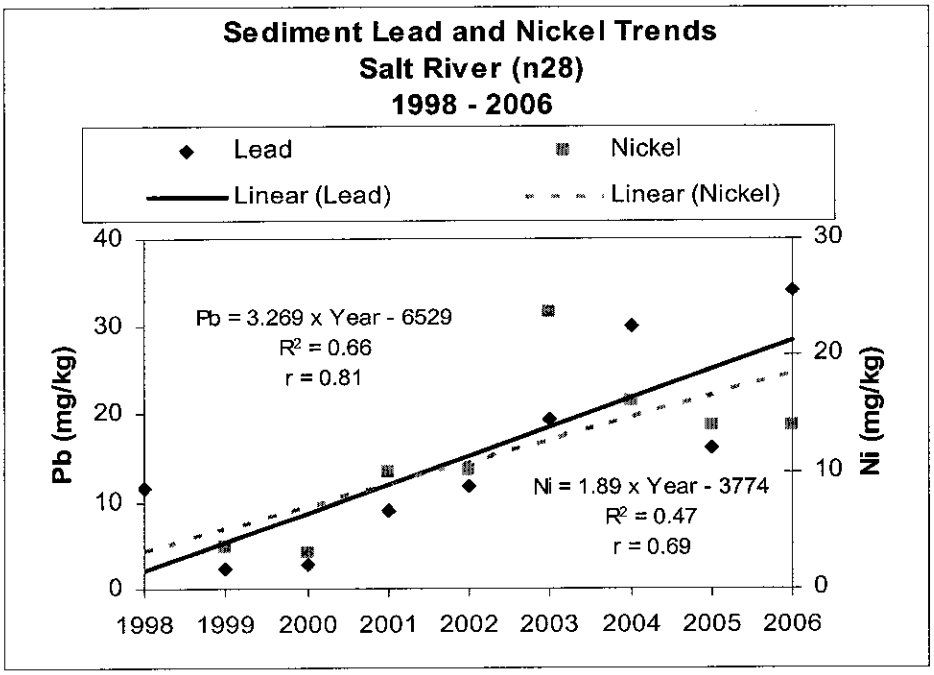


Chart 50: Salt River (n28) sediment lead and nickel trends 1998 – 2006

The trend toward increasing ammonia levels in the sediments at Milk River (n1), Salt River (n28), and Irwin Branch Relief Drain (n24), continued in 2006 (Chart 51).

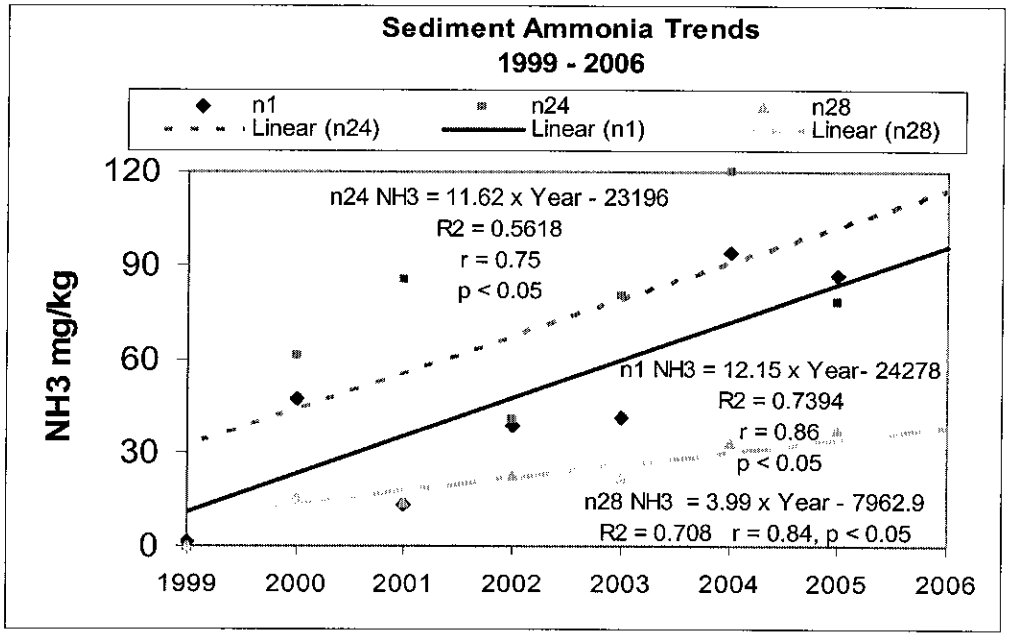


Chart 51: Milk River (n1), Salt River (n28), and Irwin Branch Relief Drain (n24) sediment ammonia trends 1999 – 2006

The very high correlation which has been monitored in the last several years between sediment chemical oxygen demand and total organic carbon at the Salt River site (n28) continued in 2006 (Chart 52).

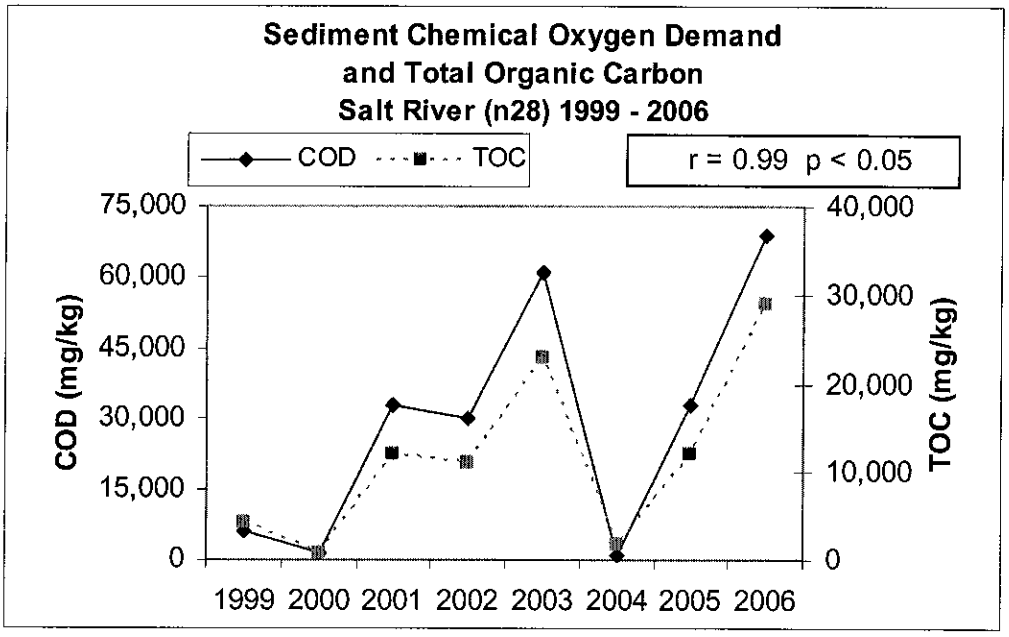


Chart 52: Salt River (n28) COD and TOC trends 1999 – 2006

Another strong relationship was noted between sediment cadmium and zinc at the Clinton River Spillway (n19) (Chart 53).

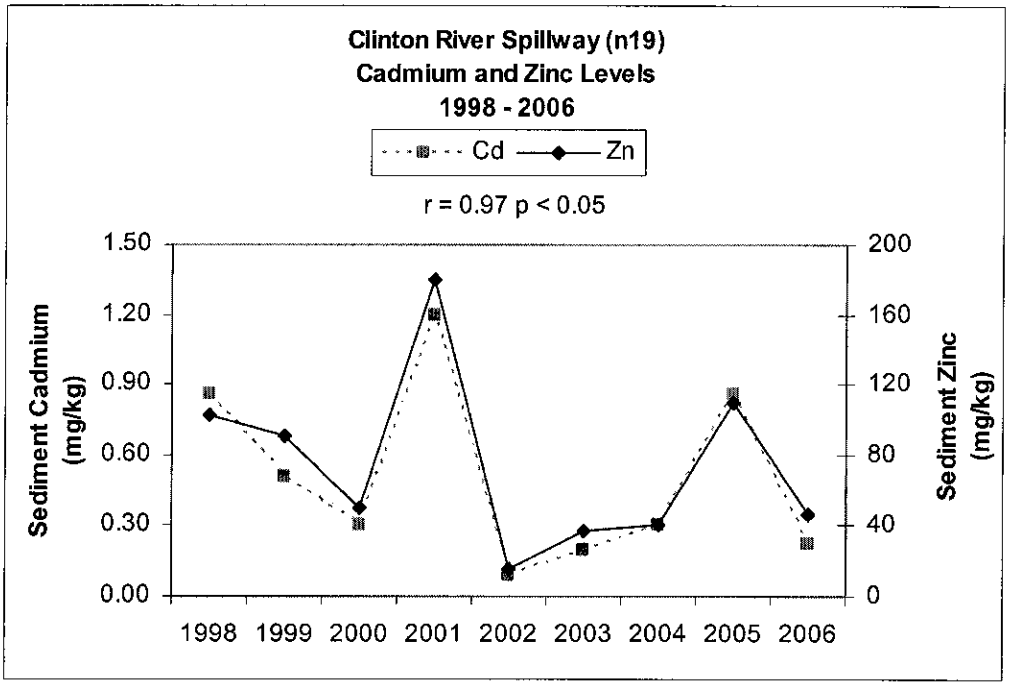


Chart 53: Clinton River Spillway (n19) cadmium and zinc levels 1998 – 2006

The close association between sediment zinc, lead, and arsenic, which has been monitored for several years, continued this year. At Milk River (n1), all three sediment metal concentrations were significantly correlated with each other (Chart 54).

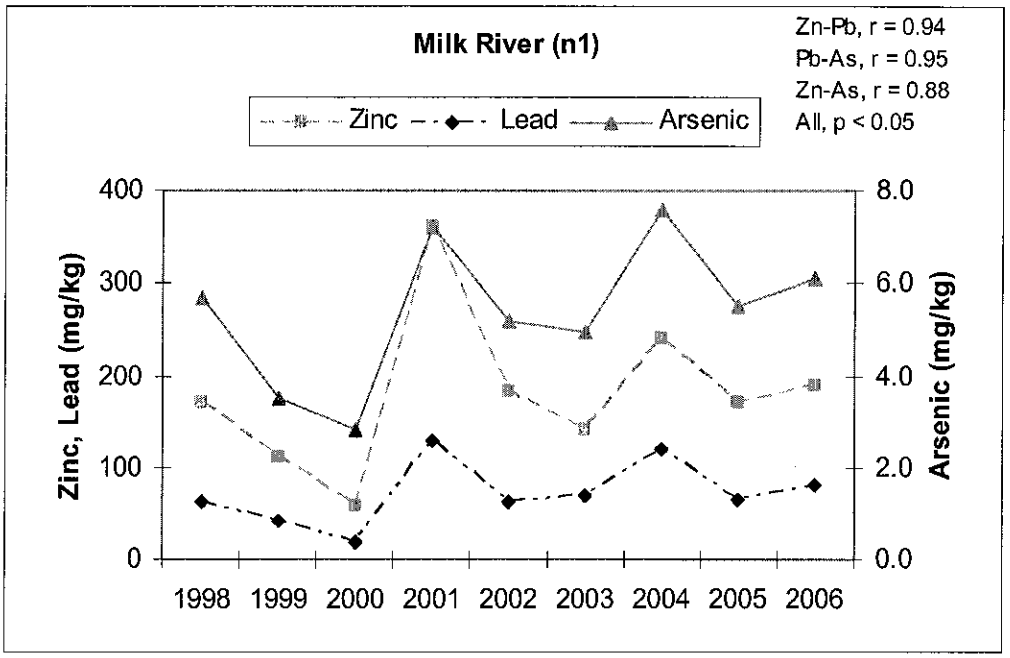


Chart 54: Milk River (n1) sediment zinc, lead, and arsenic trends 1998 – 2006

The PNA trend at Stephens Relief Drain (n4) showed gradually increasing levels from 1998 to 2006 (Chart 55).

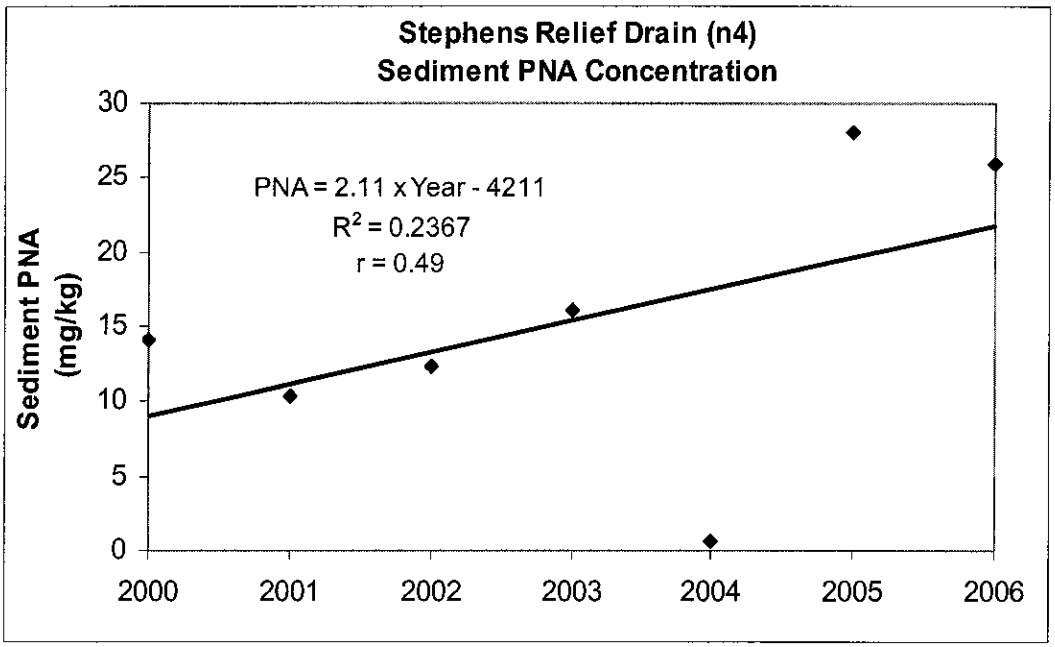


Chart 55: Stephens Relief Drain (n4) sediment PNA trend 2000 – 2006

Microbiology

The daily geometric means for *E. coli* samples taken from all Lake St. Clair sample sites show a statistically significant decrease over the period of 1998 to 2006, using an exponential regression (Chart 56).

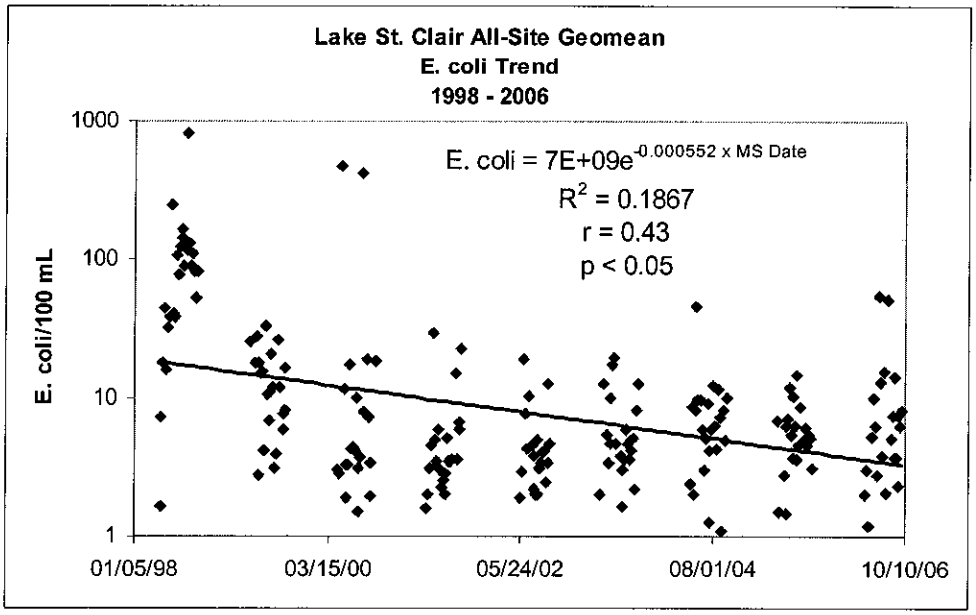


Chart 56: Lake St. Clair all-site *E. coli* geomean trend 1998 – 2006

Statistically significant *E. coli* decreases were demonstrated at the Clinton River (o5), Mt. Clemens Water Treatment Plant (o7), and Memorial Park (o9) off shore sites for the years 1998 – 2006 (Charts 57 - 59).

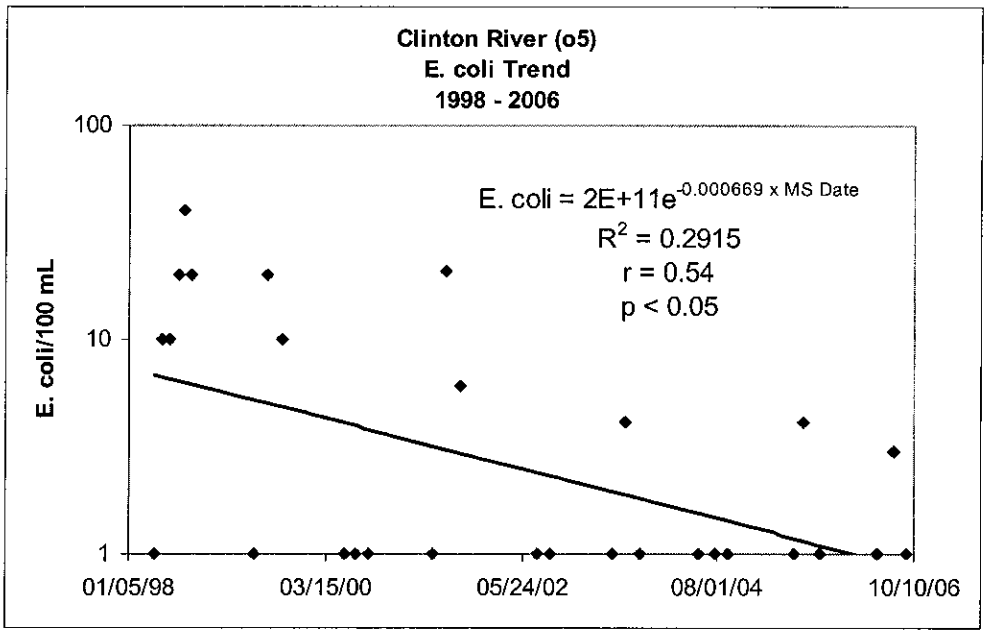


Chart 57: Clinton River (o5) off shore sample site *E. coli* trend 1998 – 2006

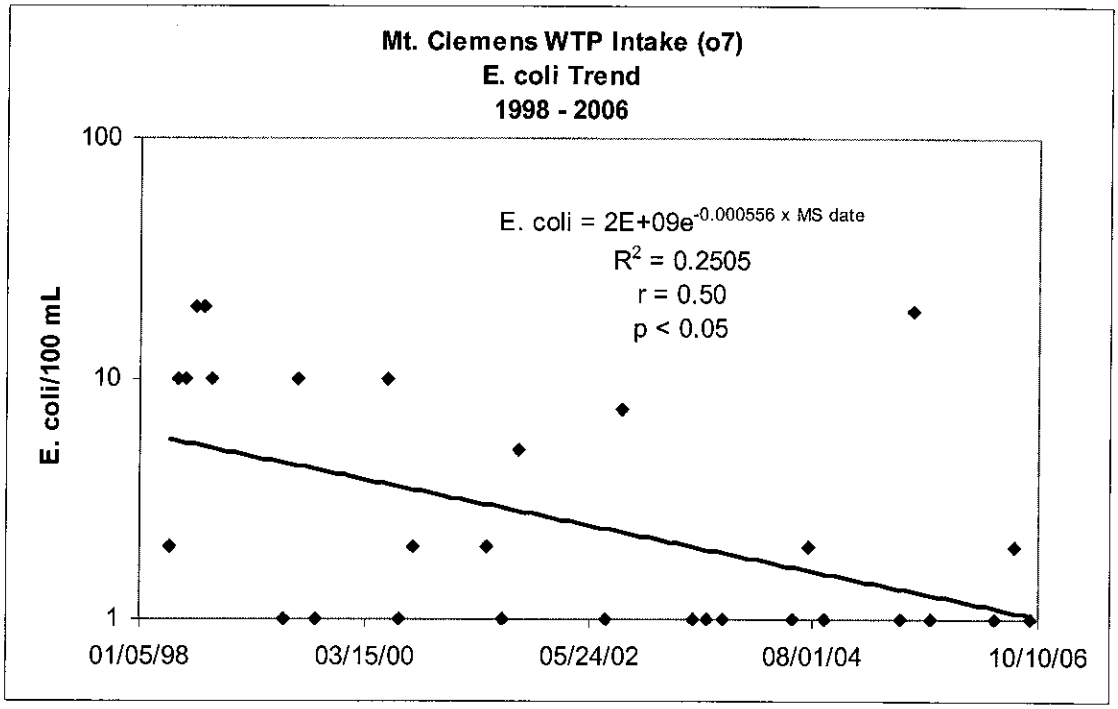


Chart 58: Mt. Clemens WTP Intake (o7) sample site *E. coli* trend 1998 – 2006

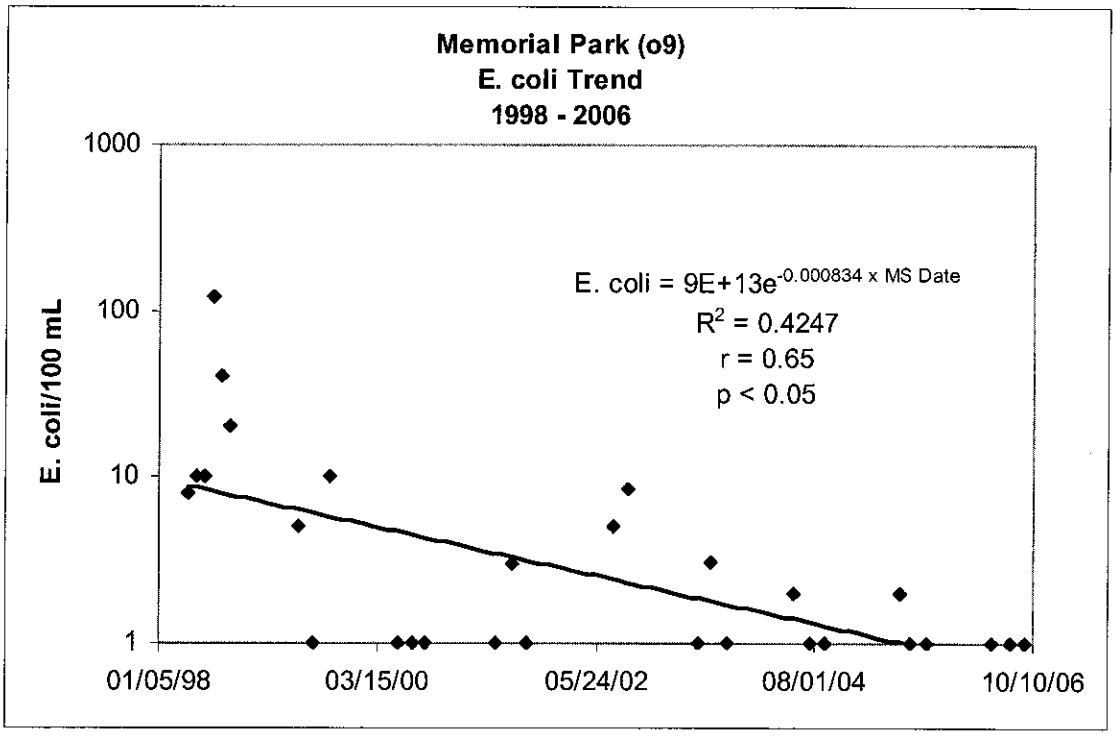


Chart 59: Memorial Park (o9) sample site *E. coli* trend 1998 – 2006

Statistically significant correlations between *E. coli* counts and 72 hour precipitation for the period 1998 – 2006. were found at Milk River (n1), Liberty Drain (n2), Stephens Relief Drain (n4), Clinton River (n23), Irwin Branch Relief Drain (n24), Salt River (n28), and Metropolitan Beach (o6).

A statistically significant correlation between log-transformed values for aqueous and foreshore sand *E. coli* was found at Blossom Heath beach between 2004 and 2006 (Chart 60).

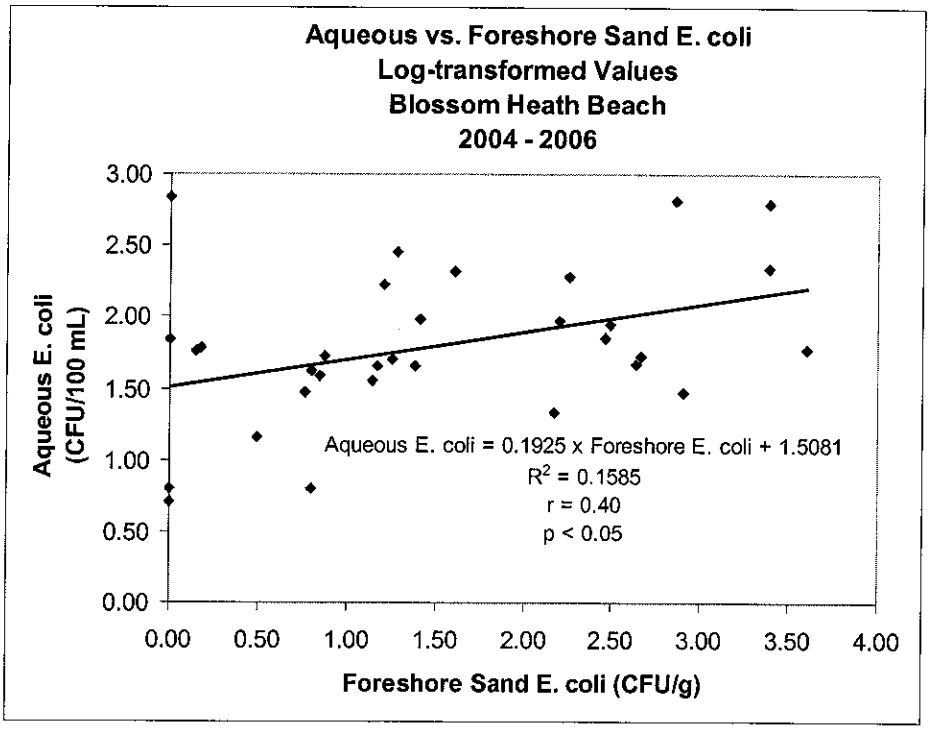


Chart 60: Blossom Heath Beach aqueous- foreshore sand *E. coli* correlation 2004 – 2006

Basic Water Quality Parameters

Water temperature was found to have a statistically significant relationship to dissolved oxygen at Irwin Branch Relief Drain (n24) for the period 1998 - 2006 (Chart 61).

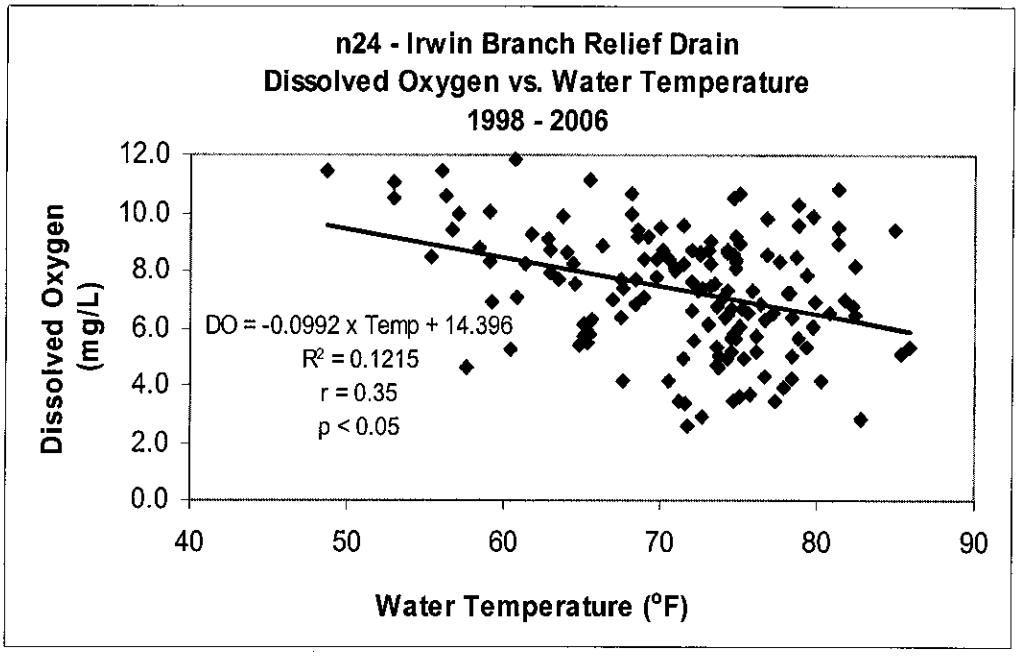


Chart 61: The relationship between water temperature and dissolved oxygen at Irwin Branch Relief Drain (n24)

Conductivity and pH were found to be inversely related at the Clinton River (n23) (Chart 62), but directly related at Metropolitan Beach 9 (o6) (Chart 63). This is noteworthy because the Metropolitan Beach sample site (o6) is located within the flow of the water coming from the Clinton River. It also seems noteworthy that no statistically significant correlations could be established between the annual averages of any water quality parameters at these two sites between 1998 and 2006.

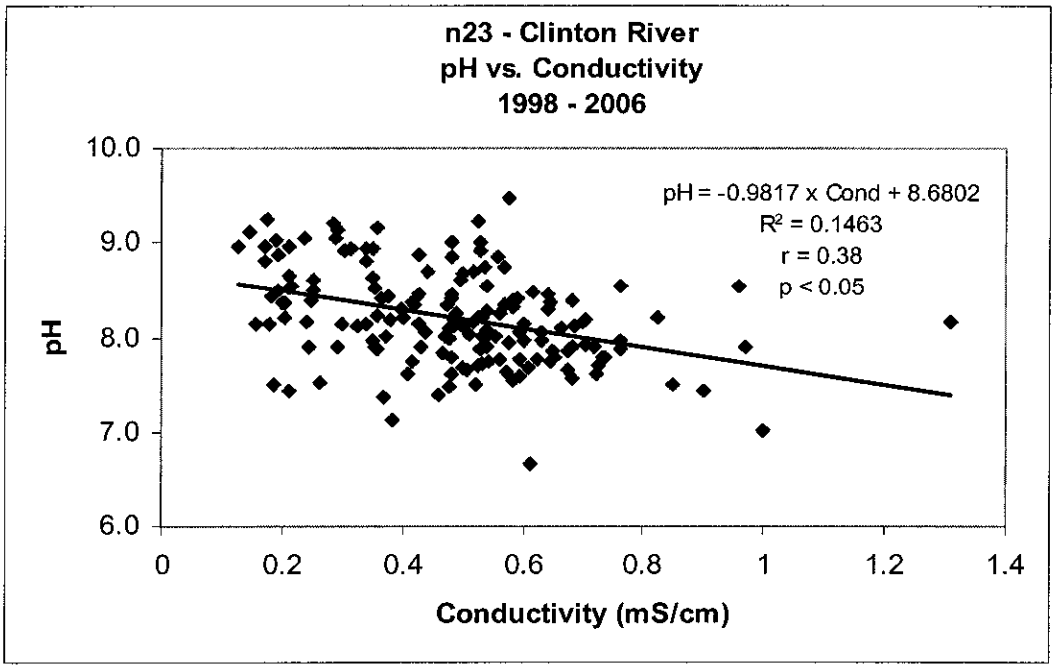


Chart 62: The relationship between conductivity and pH at Clinton River (n23)

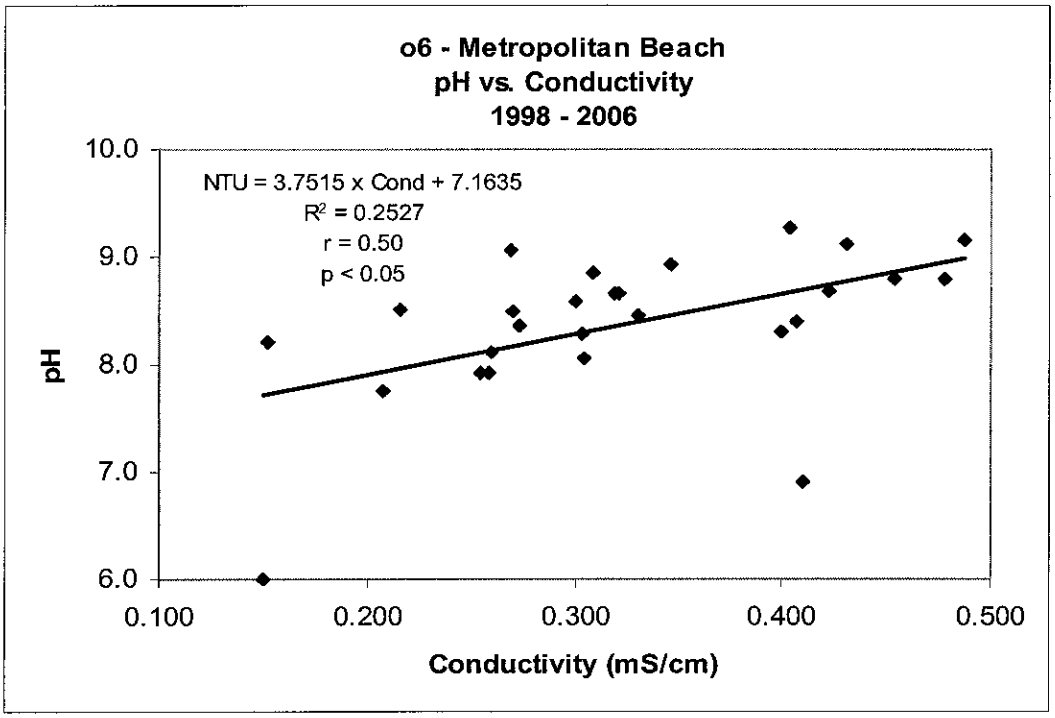


Chart 63: The relationship between conductivity and pH at Metropolitan Beach (o6)

ACKNOWLEDGMENTS

This project was funded through grants from the Macomb County Board of Commissioners.

Special thanks are extended to Belle Maer Harbor for providing a boat for sample collection. Selfridge Air National Guard Base provided climatological data.

RECYCLABLE
PAPER

RESOLUTION NO. _____ MEETING DATE: _____

AGENDA ITEM: _____

MACOMB COUNTY, MICHIGAN

RESOLUTION TO: Approve payment of $25,000 to Harrison Township from the Environmental Problems: Lake/River Fund for phragmite control

INTRODUCED BY: Commissioner Philis DeSaele, Chairperson, Health Services Committee

Harrison Township has completed the phragmite control project and is requesting reimbursement. The amount approved by the Macomb County Board of Commissioners May 24, 2007 was $25,000.

Health Services --- July 17, 2008

CHARTER TOWNSHIP OF HARRISON

July 3, 2008

Commissioner Philis De Saele
Macomb County Board of Commissioners
1 S. Main St.
Administration Building -- 9th Floor
Mount Clemens, MI 48043

Dear Commissioner De Saele:

The Macomb County Board of Commissioners last year approved a grant in the amount of $25,000 for phragmite control in the Township of Harrison. I was advised by county staff that no specific forms are used for grant processing by the County, but that the request should be made directly to you.

The work has been completed for the Township by a firm by the name of Water Landscapes. Attached you fill find a brief report outlining the work that was done, and a copy of the contract and invoices from Water Landscapes.

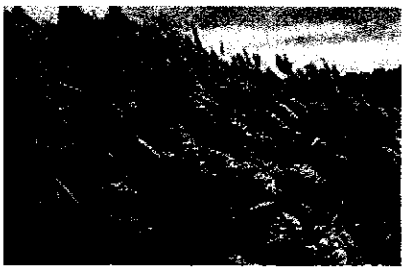
At this time we are requesting reimbursement from the County for the $25,000 expenditure.

We would like to thank you and the Board once again for the funding to assist us with this program. If any other documentation is required, please contact me directly at 586.466.1438.

Sincerely,

Glenn Spencer
Finance Director

Control and Management of Invasive Phragmites



Phragmites australis (frag-MY-teez), also known as common reed, is a perennial, wetland grass that can grow to 15 feet in height. While *Phragmites australis* is native to MIchigan, an invasive, non-native, variety of phragmites is becoming widespread and is threatening the ecological health of wetlands and the Great Lakes coastal shoreline. Invasive phragmites creates tall, dense stands which degrade wetlands and coastal areas by crowding out native plants and animals, blocking shoreline views, reducing access for swimming, fishing, and hunting and can create fire hazards from dry plant material.

Phragmites can be controlled using an integrated pest management approach which includes an initial herbicide treatment followed by mechanical removal (e.g., cutting, mowing) and annual maintenance. For large areas with dense stands of phragmites, prescribed burning used after herbicide treatment can provide additional control and ecological benefits over mechanical removal. Early detection is key to preventing large dense stands and is also more cost efficient.

Excerpted from the Michigan State Department of Natural Resources website

The Township of Harrison contracted with Water Landscapes, a firm with the expertise and equipment to provide phragmite weed control. Water Landscapes sprayed and cut down phragmites in Harrison Township along North River Rd., Metro Parkway, Cherry Lane, and specific sections of the Clinton River.

The intent was, as identified above, to reduce the threat to wetlands in the area, but also to minimize the safety hazard caused by the phragmites. When these weeds dry out during the hot summer months, they create significant a fire hazard. Last summer the Harrison Fire department had to quell a large brush fire of burning phragmites along Jefferson Ave near Metro Parkway.

The services provided were successful for the areas that were treated.

Water Landscapes
507 Harper
Pontiac, MI 48342 248-379-5351 Fax 248-338-4826

CONTRACT FOR PHRAGMITES SPRAYING AND CUTTING-2007

Adam Wit
38151 L'anse Creuse
Harrison Township, MI 48045

This proposal may be changed by you, the customer, at anytime. These changes must be discussed by both parties and can result in a new agreement both in scope of service and in cost. At anytime these plans can be canceled by paying for all services provided to that date. Before we begin the work both parties will meet in person to discuss major and minor detail, go over maps, and answer any other questions by either side.

Main Objective: Our main objective is to spray the phragmites in the areas specified by the Deputy Supervisor of Harrison Township and cut the phragmites down after they have been killed off by the chemical. The objective is to push the phragmites back no more than 10-15 feet in each section. Our goal is to reduce the amount of phragmites growing this year, not to eliminate all of them.

Scope of Work: Water Landscapes will begin by spraying the phragmites in designated sections. South Perimeter Rd. section, Metro Parkway bike path section, The River (Southwest of Ballard St.) section, The Creek section (between Metro Parkway and Jefferson Ave.), and the section along the Eastside of Cherry Lane. We will spray the phragmites and then cut them down after we see noticeable discoloration. After the phragmites are cut down they will be raked back and be left to decompose. The phragmites alongside the River section will be sprayed but not cut down because of the degree of difficulty to access them.

Pricing:

North River Road Section.....	$2,500.
Metro Parkway Bike Path Section.....	$8,000.
Spillway Section.....	$6,500.
Parkway Section.....	$9,000.

(Water Landscapes will require half of the total to be paid before we begin the project.)

Accepted By:_____ Date:_____

If you have any questions or concerns about the proposal please feel free to contact me at **248-379-5351.**

I agree to perform the above services for the agreed upon price. I wish to state that I appreciate each customer and I will strive to achieve results that will exceed your expectations. Thank you for the opportunity to do business with you.

Cordially,

Jason Zimmerman

Water Landscapes
507 Harper
Pontiac, MI 48342 248-379-5351 Fax 248-338-4826

Invoice for Phragmites Control
Harrison Township

Charter Township of Harrison
C/o Supervisor-Anthony Forlini
38151 L'Anse Creuse
Harrison Township, MI 48045

Terms: Upon Receipt

This invoice is for the first part of the phragmites control in Harrison Township.

Total for this invoice..... $13,000.

Please make check payable to **Water Landscapes**
Mailing Address: **507 Harper St.**
Pontiac, MI 48342

Thank you for your business.

Cordially,

Jason Zimmerman

Water Landscapes
507 Harper
Pontiac, MI 48342 248-379-5351 Fax 248-338-4826

16707

RECEIVED

APR 18 2008

HARRISON TWP. ACCOUNTING

2530

A-7

Invoice for Phragmites Control
Harrison Township

Charter Township of Harrison
C/o Supervisor-Anthony Forlini
38151 L'Anse Creuse
Harrison Township, MI 48045

Terms: Upon Receipt

This invoice is for the remaining fee for the spraying, cutting, and raking of the phragmites in Harrison Township. ($31,000-$13,000 = $18,000.)

Total for this invoice..... $18,000.

Please make check payable to **Water Landscapes**
Mailing Address: **507 Harper St.**
Pontiac, MI 48342

Thank you for your business.

Cordially,

Jason Zimmerman

READY FOR PAYMENT
P.O. # BD. Approved

101 444 810 - 18000.00

RECYCLABLE PAPER

RESOLUTION NO. _____

MEETING DATE: _____

AGENDA ITEM: _____

MACOMB COUNTY, MICHIGAN

RESOLUTION TO: Authorize the Health Department to apply for a U.S.E.P.A. grant entitled, "The Effects of Nutrients on Lake St. Clair's Ecosystem" in the amount of $52,254.00 for monitoring activity.

INTRODUCED BY: Commissioner Philis DeSaele, Chairperson, Health Services Committee

The Macomb County Health Department requests authorization to apply for a U.S.E.P.A. grant in the amount of $52,254.00 for watershed monitoring activity. This proposed monitoring would serve as an effective continuation of the recently completed Lake St. Clair Regional Monitoring Project. The sampling will also complement the Macomb County Health Department's current sampling regimen. A local match is not required, but we would like to offer an in-kind match (services) of approximately $10,409.84 for a Supervisor's, Water Quality Analyst's and Toxicologist's time, in order to increase the chance that the grant will be funded.

COMMITTEE/MEETING DATE

Health Services – July 17, 2008

RECYCLABLE
PAPER

RESOLUTION NO. _____ MEETING DATE: _____

AGENDA ITEM: _____

MACOMB COUNTY, MICHIGAN

RESOLUTION TO: Receive and file a progress report from Macomb County Animal Shelter

INTRODUCED BY: Commissioner Philis DeSaele, Chairperson, Health Services Committee

The latest activities at the Macomb County Animal Shelter will be discussed.

Health Services --- July 17, 2008